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Enterotoxemia Of Sheep And Its Control*

E. M. BALDWIN, JR.,** B.S., D.V.M., M.S., Omaha, Nebraska

THE importance of enterotoxemia losses to the sheep industry of the United States is evidenced by the large scale usage and acceptance of the immunizing agents perfected to protect against this disease. The products, *Clostridium perfringens* Type D bacterin and *Clostridium perfringens* Type D antitoxin,*** were first introduced to the veterinarians of this country in 1947 and since that time the demand has increased rapidly.

Enterotoxemia is unique in that it is a combination of nutritional and infectious disease problems. The ingestion of large quantities of highly nutritive feedstuffs is the necessary prerequisite which activates the disease. It is for this reason that the term "overeating disease" has come into being. The bacterium responsible for enterotoxemia is *Clostridium perfringens* Type D (*Cl. welchii*). Types A, B and C also exist but they are not thought to be of significance in causing losses in sheep of this country. Perhaps future investigations shall find this not to be the case. The Type D organism is widely distributed in nature, being found in the soil and existing as a saprophyte in the lower bowel of sheep. Heavy feeding activates the organism by providing an ideal environment for its growth. Under such conditions a powerful toxin is formed which is absorbed into the circulatory system by a means not thoroughly understood. The contents of the bowel of lambs dead of enterotoxemia may contain 100 times the toxin necessary to destroy the animal.

Occurrence and Importance

Enterotoxemia losses in feeder lambs are reported to be greater than those from all other conditions combined. Death losses are expected and accepted as being a known hazard in the feeding of lambs. In order to secure rapid gains and have lambs finished in 60 to 70 days, many feeders were willing to accept a 3% to 5% death loss. The practice of "lambing down" grain fields frequently leads to disaster since the ration cannot be controlled as it is in the dry lot and consequently in some areas it has been totally discontinued because of heavy death loss.

In certain range areas, suckling single lambs a few days of age are victims of enterotoxemia. Presumably the larger supply of milk available to the single lamb provides the necessary prerequisite of rich feedstuff. Older range lambs given access to luxuriant grass land may also be likely victims of enterotoxemia. Under such conditions losses are most likely to occur shortly after a change in pasture. It is advisable never to make a sudden change from poor pasture to rich pasture because of the danger involved.

Symptoms

Because lambs stricken with enterotoxemia die suddenly, symptoms are not frequently observed under field conditions. The occasional affected animal seen will show a rapidly progressive weakness accompanied by signs of a central nervous disturbance, such as a thrown back head, circling, or pushing against an object.

Prostration is accompanied by convulsions, a comatose condition, or both. The head is frequently thrown back and will resume that position after it is forcefully changed. Diarrhea may occur as a prodromal symptom or at any time during the course of symptoms. The average course of the disease extends over a period covering four to eight hours.

Chronic enterotoxemia may be encountered. Lambs so affected lose their appetite, and suffer from a severe diarrhea and its consequences. An occasional chronically affected lamb may recover after several days of illness.

Postmortem Lesions

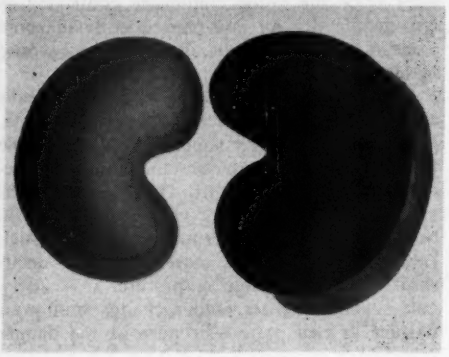
The most consistent lesion of enterotoxemia in feeder lambs appears to be cardiac hemorrhages, the size and location of which vary considerably from minute petechiae to large blotches located subendocardially, subepicardially, or any combination thereof. A complete absence of other outstanding pathology is not unusual. Other lesions observed somewhat regularly are hemorrhages throughout any or all of the other major tissues, an excess of peri-

*Presented at the 27th Annual Short Course for Veterinarians, University of Minnesota, St. Paul.

**The Corn States Serum Co.

***For the sake of simplicity and space conservation, the terms bacterin and antitoxin are used to refer to *Clostridium perfringens* Type D bacterin and *Clostridium perfringens* Type D antitoxin, respectively, throughout the balance of this paper.

cardial fluid frequently containing clots, marked pulmonary congestion involving the bronchi and trachea, and "pulpy" kidneys. The latter lesion is never observed in lambs which are autopsied shortly after death, but almost invariably found when the examination is delayed four hours or more. This lesion is responsible for the term "pulpy kidney disease."



Normal (left) and "pulpy" kidneys. These organs often become so soft and mushy that they can be squeezed through the fingers.

Diagnosis

Accurate field diagnosis is based upon the history of sudden deaths in lambs exposed to rich feedstuffs and the finding of the forementioned lesions. Laboratory aid may be enlisted. If such aid is desired, a tied-off section of the ileum containing at least 30 cc. of intestinal contents should be submitted as well as the usual tissues. Enterotoxemia has been mistakenly diagnosed as hemorrhagic septicemia, coccidiosis, and plant or chemical poisoning.

Control

The use of sulfur or soda mixed in the feed have been advocated for the control of enterotoxemia. Both agents are reported to be effective but have obvious limitations and disadvantages. Under dry lot conditions feed consumption may be regulated to control enterotoxemia losses. Such a method is not without danger, particularly in certain groups of lambs which seem to be more susceptible than the average. In addition, such a feeding procedure is considered more costly than that utilizing self feeders or other labor saving devices.

The enterotoxemia biologics are prophylactic agents, although some virtue has been reported by veterinarians from the use of the antitoxin on lambs exhibiting symptoms of enterotoxemia. Each of the products has specific indications and limitations which require thorough understanding if successful results are expected.

The bacterin is in reality a whole culture toxoid but because of the presence of the bacterial cells, the term bacterin has been retained. The toxoid present in this product is responsible for its immunizing effect and its effectiveness is directly proportional to the concentration of toxoid.

Immunity is first detectable seven to 12 days following injection. For practical purposes an average of ten days may be considered as the time required for development of immunity. Bacterin of proved potency will provide protection for approximately six months. Experimental results have shown potent bacterin to immunize approximately 90% of lambs treated. One of the primary prerequisites for successful results is that vaccination be confined strictly to healthy flocks of lambs over two months of age. Lambs under two months do not respond uniformly to immunization. The bacterin produces a reaction within the animal which, if combined with any sort of illness such as pneumonia, parasitism, enteritis, etc., may produce a general or local reaction. Lambs which have undergone a long and arduous shipment are also unfavorable prospects for vaccination. Such animals are in a weakened condition and should be permitted to return to normal before an immunization procedure is initiated. Freshly shorn lambs are not good prospects for immunization for the same reason and at least a two-week interval after shearing should be allowed before vaccination.

Under all conditions the owner of lambs should be warned that ten days are required after vaccination for resistance to enterotoxemia to be developed within the animals. In addition, he should be told that vaccination for enterotoxemia does not provide immunity to any other type of disease condition nor does it or any other immunizing operation serve as a substitute for good husbandry and sound management.

Sheep and lambs on full feed at the time of vaccination may die of enterotoxemia during the ten day immunity-developing period. In all cases, the preferable time of vaccination is prior to full feeding.

The site of injection should be in the wool-free area posterior to the axillary space. The bacterin should be injected subcutaneously, since undue irritation will result from intramuscular injection. If such a procedure is followed under aseptic conditions, little or no

lameness will result in the vaccinated animals and the vaccine will be properly absorbed. Many veterinarians have utilized automatic syringes in carrying out the vaccination operation. It is recommended that a 16 to 18 gauge, ¾ inch needle be used.

The bacterin should, under all conditions, as with other biologics, be kept under refrigeration. A definite drop in potency is known to occur if such precautions are not taken.

The bacterin and antitoxin should not be used simultaneously. The antitoxin will impair the antigenic stimulation of the bacterin. Bacterin may be employed two to three weeks following the antitoxin.

tures may be utilized with little danger. Caution should be exercised to prevent vaccinated lambs from becoming too hungry since such animals, when provided with unlimited supplies of grain, are apt to engorge themselves and die as a result. The symptoms exhibited by such animals may resemble enterotoxemia.

In the western states, losses in suckling lambs may be controlled by vaccinating the pregnant ewes one to two months before lambing. The immunity built up in the ewe will be transferred to the offspring by the colostrum. Such practice is reported to provide protection to the baby lamb for one to two months.

The antitoxin is intended primarily as a pro-

—*Photo courtesy of Colorado Agricultural Experiment Station.*

Typical attitude of enterotoxemia in a feedlot lamb.

Other ovine biological products may be used simultaneously with bacterin or antitoxin. However, they should be injected at a different site and under no conditions mixed in a common container with enterotoxemia biologics.

The bacterin may produce at the site of injection a variable degree of local reaction, which is generally absorbed within a 30-day period. If lambs are marketed before this time interval has lapsed, it may be necessary for the carcass to be trimmed of this lesion. It is advisable to inform the owner that lambs treated with the bacterin should not be marketed for slaughter purposes until 30 days or more after vaccination. After the expiration of the average ten-day period for development of immunity, concentrates may be self-fed. Grain fields, winter wheat fields and lush pas-

phylactic agent to stop heavy death losses in feeder, range or suckling lambs. The average dosage is 5 to 10 cc., and the immunity provided is immediate but temporary, lasting approximately two to three weeks.

In the case of feeder lambs where heavy losses are being experienced and facilities are not available to protect the lambs from overfeeding during the ten-day interval required by the bacterin, or in lambs which will be finished for market in thirty days or less, antitoxin is the product of choice. Losses will stop in 24 hours and no restriction need be placed upon the feed intake after treatment. The set-back ordinarily encountered when lambs on full feed are suddenly placed on a reduced diet thus may be eliminated. The use of bacterin in lambs which are expected to be finished in 30 days or less is undesirable be-

cause of the ten days of susceptibility, the danger of vaccine lesions, and the short period of protection provided. When losses threaten, antitoxin provides immediate protection with no danger of local tissue reaction and does not necessitate a reduction in the feed intake.

The therapeutic value of antitoxin is not definitely known. Field reports indicate that it has merit when administered at three to five times the prophylactic dose, provided treatment is given during the initial stages of the disease.

For more detailed information and research data to support the use of the enterotoxemia biologics, the reader is referred to the bibliography at the end of this paper.

Summary

Enterotoxemia (overeating disease, pulpy kidney disease) of sheep is an acute toxemia caused by the Type D toxin of *Cl. perfringens* (*Cl. welchii*) and associated with ingestion of highly nutritive feedstuffs. Losses from this disease may be controlled and prevented by the use of potent *Clostridium perfringens* Type D bacterin and *Clostridium perfringens* Type D antitoxin. These biological products have their specific uses and limitations and their successful usage is dependent upon an understanding of these factors. The bacterin should be injected subcutaneously under aseptic conditions in the wool-free area posterior to the axillary space. The vaccine lesion produced by the bacterin is generally absorbed in 30 days, during which time the lambs should not be marketed for slaughter. Immunity is detectable in vaccinated lambs in approximately ten days and persists for an average period of six months. Particular attention should be directed to the health of animals which are to be vaccinated because of undesirable reactions that may be encountered in sick, weakened, or freshly shorn lambs.

Lambs which have been satisfactorily immunized may be fed safely in grain fields, rich pastures, and at self feeders in the dry lot.

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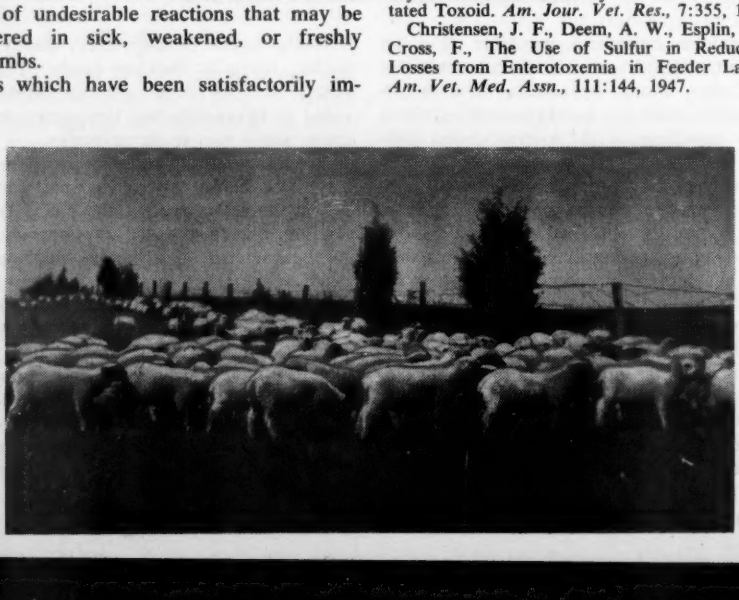

Problems In Swine Reproduction*

A. V. NALBANDOV,** B.S., M.S., Ph.D., Urbana, Illinois

ABOUT 3,000,000 of the sows and gilts raised annually in the United States for breeding purposes, are sterile. The causes of their sterility have been investigated during the last few years and the different types of sterility and their relative importance have been established. The conclusions to be presented here were based on studies conducted at packing houses and involving animals whose past breeding performance was unknown and on 95 sows and gilts purchased from cooperating breeders located in the vicinity of Champaign-Urbana. On these latter animals, complete breeding records were available and the proportion of barren females to the whole breeding population could be determined..

Of the females culled by breeders as sterile because they had not conceived by the end of the fall or spring breeding seasons, 50% conceived when brought to the University. They had all been bred previously in four to six different heats to boars of known fertility but had failed to become pregnant. Pregnancy resulted after one service at the University. For this reason these females cannot be considered to be sterile and are more properly classified as being hard to settle. From the point of view of the breeder, however, they are sterile since their failure to reproduce rendered them useless for the breeding herd. At autopsy no abnormalities were found in these animals and thus no explanation could be found for their anomalous behavior.

The remaining 50% of the sows and gilts were infertile because certain defects of their reproductive systems prevented conception or rendered it extremely unlikely. Most of these defects were found only at autopsy and could not have been diagnosed prior to a postmortem examination. The immediate cause of their failure to reproduce was due to anatomical abnormalities illustrated and discussed here.

Anatomical Abnormalities

The most common anatomic abnormality was the hydrosalpinx. (Fig. 1.) In this condition usually both fallopian tubes were involved but an occasional unilateral hydrosalpinx was found. Constrictions in tubes caused them to become filled with fluid or with solid debris, thus obstructing their lumen. These sometimes greatly enlarged tubes, were so completely blocked that a union of the eggs and sperm,

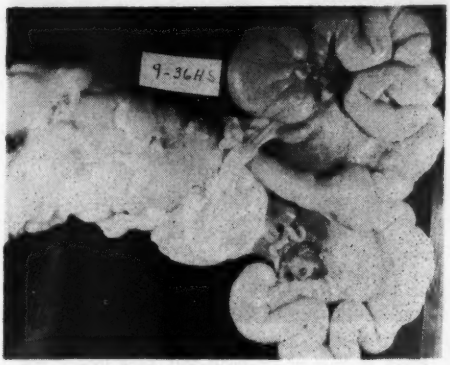

Fig. 1. Unilateral hydrosalpinx shown here and involving the left oviduct, is less frequent than bilateral hydrosalpinx. This is the most common cause of sterility in swine. It occurs almost exclusively in gilts.

and thus fertilization, was impossible. This condition is found almost exclusively in gilts and only very rarely in sows. This and the fact that no infecting organisms could be isolated from the contents of hydrosalpinges and that the condition could not be induced in normal females, argues against the assumption that these abnormalities of the oviducts are due to infections. Sterility resulting from hydrosalpinges is incurable and permanent.

Other anatomic causes of sterility, though less frequent than hydrosalpinx, are blind uterine horns or missing portions of the reproductive tract. (Fig. 2.) Thus, one whole uterine horn or the cervix or the vagina might be partly or completely missing. Wherever blocking of the pathway between sperm and eggs occurred, complete and irreparable sterility resulted. Interesting exceptions to this rule are the cases in which one uterine horn was found to be blind while the opposite was patent. In such cases, fertilized eggs were invariably recovered from the patent side, yet pregnancy in the open side was found to be extremely

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**Associate Professor, Animal Physiology, Department of Animal Science, University of Illinois, Urbana.

rare, and then with litters of only one or two pigs. Since in all such cases considerable amounts of fluid were found to be accumulated in the blind side, it is thought that the accumulated liquid may be toxic thus preventing implantation and pregnancy in the patent side of the uterus. In cases in which one whole uterine horn is missing, pregnancy is possible and is frequently observed but the litter size is usually reduced to one or two pigs. (Fig. 3.)

None of the defects discussed so far can be diagnosed except that such animals are all sterile.

Fig. 2. Right uterine horn is "blind." Note accumulation of fluid in the blind part. Even though left side is patent and eggs here become fertilized, such animals are usually sterile.

Cystic Ovaries

The second most common cause of sterility is cystic ovaries. (Fig. 4.) In contrast to the anatomic anomalies leading to sterility, diagnosis of cystic ovaries is frequently possible. Swine, unlike cows and mares, do not show nymphomania when ovarian follicles become cystic. In such swine, heat periods recur at irregular and unpredictable intervals instead of the expected 21 days. In several cases, no heats at all were observed over periods of six months. This irregularity in the occurrence of heat is one criterion by which it is possible to recognize the presence of cystic ovaries. The other criterion which was found quite useful is the enlarged clitoris (fig. 5) typical of animals in which ovaries are or have been cystic.

It is also of interest to note that the bioassay of the cyst fluid showed that the large cysts, which were most commonly found in swine, were almost completely devoid of estrogen. This may account for the fact that no nymphomania is observed in swine. Large amounts of progesterone are typically found in these cysts and it is assumed that it is this hormone which causes the enlargement of the clitoris since it is known that it may have effects similar to those of the male sex hormone.

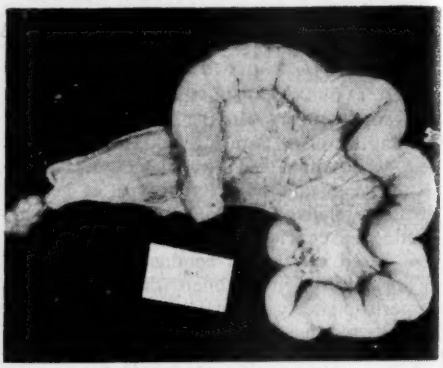

Fig. 3. Left uterine horn, but not the ovary, is missing. Such animals are fertile, but reproductive efficiency is reduced.

Summary

Anatomical and endocrine abnormalities combined account for about 5% of the causes of sterility of the breeding population. Another 5% belongs to the hard-to-settle group which eventually conceives, but requires so many services, that from the point of view of the practical breeder they are sterile. In addition to these two groups, it is estimated that another 10 to 15% of the total breeding population shows some degree of impairment of fertility. In this group, the litter size is drastically reduced to as low as one or two pigs per litter. This is due to intrauterine fetal mortality after the implantation of a litter of nor-

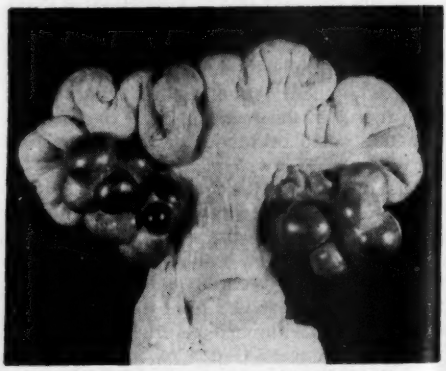

Fig. 4. Cystic ovaries are caused by hormonal imbalance and result in prolonged or permanent sterility. Large cysts shown here are much more common than the smaller but more numerous cysts.

mal size and could not be blamed on infectious organisms. Nothing is known concerning the physiological causes behind this almost complete intrauterine fetal resorption or the inability of certain hard-to-settle females to conceive after a normal number of services. Work in progress now deals with these problems.

One question which is frequently asked is whether one should attempt to cure sterility in animals so afflicted. Since most types of ster-

Fig. 5. Enlargement of the clitoris is one good diagnostic sign of cystic ovaries.

ility have, without doubt, a genetic basis, two schools of thought have developed. It can be argued that all animals suspected of anatomical, endocrine and physiological abnormalities should be vigorously culled and that under no condition should anything be done to return females or males whose reproductive processes are defective. For this reason one should not use the progeny from dams or sires who require an endocrinological assist for reproduction. This would be especially true of males and females which show genetic excellence in all respects except breeding performance and from which the breeder is particularly interested in obtaining offspring because of their production records. The opponents of this view point out, with some justification, that the heritability of reproductive disorders is apparently so low that any damage done by retaining animals afflicted with reproductive disorders in the breeding herd, would be very slow in assuming any degree of importance in lowering the overall reproductive performance of most breeding herds. In view of the fact that neither side can cite enough convincing evidence in support of their opinions, it is not possible to make any definite recommendations until good experimental proof for or against these views becomes available.

Film, Valiant Years, Popular

The veterinary public relations motion picture, Valiant Years, will have over 5,000 public showings this year, according to a report on bookings made by Associated Serum Producers, sponsors of the film.

This is the largest number of appearances for the picture in any year since it was produced. The showings are being made to farm bureaus, vocational agriculture classes, church and school groups, and civic clubs.

The film portrays the story of a typical veterinarian and the service he renders to his community. It was produced by Associated Serum Producers as a public relations vehicle for the profession, and is now released through film exchanges throughout the United States and Canada.

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New USDA Screwworm Remedy Announced

A new treatment for the control of screwworm, the most destructive livestock insect pest in southern states, is to be known as EQ 335 screwworm remedy. It will replace the Department's EQ 62 known to stockmen for the past decade as the most effective of all remedies for screwworm control.

The new formula contains three parts of lindane, 35 parts of pine oil, 42 of white mineral oil, ten of an emulsifier, and ten of a silica gel. It is applied to wounds with a small paint brush. The treatment kills maggots deep in the wounds, young maggots as they hatch from eggs, and flies attracted to the wound to feed or lay more eggs.

The killing of flies attracted to wounds is an attribute new to Department screwworm remedies. This will help reduce the number of animals attacked by the flies.

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The success of efforts to eradicate foot-and-mouth disease in Mexico are now in the balance. Vaccinations were completed in August. The phase of the plan, inspection of animals, is now being vigorously pursued. To date, no infection has been reported though large numbers of animals have lost immunity conferred by the vaccine. Most of the animals in infected zones have been vaccinated four times since inauguration of the program in 1946.

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The BAI announces plans to employ from 200 to 300 additional veterinarians by the end of June 1952.

A Vat-Side Test For Assaying DDT-BHC In Dipping Vats

CLARENCE A. LITTLER,* Ph.D., Wilmington, Delaware

The test for determination of strength of dipping vat charge to assure results is outlined in this article. As indicated, the procedure has been used in Florida. In that state, DDT and BHC combinations in effective concentration have resulted in complete elimination of all fever tick infestation on dipped cattle. Furthermore, it is reported that such dips have made possible effective controls without resorting to the use of tick-free premises during the process.

The formulation is efficacious against other important external parasites infecting cattle, sheep, goats, and horses. Some field experience with these two insecticides has shown that their insecticidal properties are additive when used in the same application. It is claimed that the widely different insecticidal properties of DDT and BHC, when combined, provide high initial killing action and lasting residual protection against most species of ticks, mange mites, flies and lice.

The fact that these insecticidal agents when added to water disperse as solid particles and do not go into solution suggests the necessity for care in test procedures. Certainty of concentration will assure parasite killing properties of the dip on the one hand and its safety on the other.

Repeated tests during dipping will determine the requirements of water or insecticide to maintain concentration altered by drag-out.

MIXTURES of dichlorodiphenyl trichloroethane (DDT) and technical benzene hexachloride (BHC) give excellent control of tick infestations when used as either dip or spray, as first reported by Cobbett[1, 2]. In 1949, the Florida Cattlemen's Association pointed out to us the need for a way to analyze a dip made with these insecticides. Their problem was to obtain clearance for the use of DDT-BHC in place of arsenicals for treating animals being shipped from areas under fever tick quarantine. This would only be possible if tick inspectors could determine with assurance that vats were up to recommended concentration.

There are other reasons why a vat-side analysis should be beneficial. The extent of drag-out can then be determined and the minimum amount of make-up insecticide added to maintain vat strength. The margin of safety between effective and toxic doses of DDT-BHC is greater than that of some other chlorinated insecticides but it is good economics to hold the concentration to the minimum required. In addition, the effects of evaporation, rainfall and irreversible settling can be determined for vats not in constant use.

For most effective use, a vat-side test should be quick, and simple enough to be carried out by personnel without chemical knowledge. No simple colorimetric test is known for DDT or BHC. Furthermore, no method short of elaborate laboratory procedure can hope to distinguish one active component from the other. Nevertheless, a test for total actives would be satisfactory if no preferential extraction of one or the other occurred. That this is true of a well made composition has been established with reasonable certainty.

Concentration of active insecticide in a dip can be measured by extracting a sample with benzene and determining the change in specific gravity of the solvent. By reference to a chart, the vat concentration is determined from the specific gravity and the temperature at the time of measurement.

Properties of a dip prepared with wettable powders of DDT and BHC are such that extraction with solvent is the most difficult step in an otherwise simple procedure. Benzene used as solvent emulsifies in the water and this emulsion must be broken to obtain clear solvent for measurement.

Outline of Procedure

Apparatus:

Graduated 1,000 ml. separatory funnel (like E. & A. Cat. no. 10-416). (A separatory bottle has been substituted in Florida test kits. See page 483).

Graduated cylinder, 100 ml. with an additional calibration at 120 ml.

Hydrometer—0.800 to 0.910 range, graduated to 0.001, accurate to 0.0005 (like E. & A. Cat. no. 11-583-B).

Thermometer—range at least 32-100 F., accurate within ±0.5 F.

Benzene, tech.

Santocel C.

*Grasselli Chemicals Dept., E. I. du Pont de Nemours and Co., Experimental Station, Wilmington.

Lorol pyridinium chloride, 40% solution.

Method:

1. Selection of Sample. With a half-gallon can tied on the end of a stick, take a sample from the vat immediately after the passage of a cow so that good agitation is assured. Avoid collecting surface scum of hair and dirt.

2. Procedure. a. Sample should be poured rapidly and with continued swirling into the 1,000 ml. separatory funnel. Add exactly 700 ml. in this manner, allowing spilling of excess over the sides in order to maintain a rapid pouring rate while filling.

b. Measure 120 ml. benzene in the 100 ml. graduate and add to the suspension in the separatory funnel. The benzene should be within 10 F. of the surrounding air temperature at which final readings will be made.

c. Shake the separatory funnel vigorously for two minutes, then stand upright in a support and add four drops of lorol pyridinium chloride solution. Tip the funnel back and forth rapidly for a few seconds, then support upright and allow creaming to take place for two minutes. After two minutes, draw off and discard the lower, turbid water layer.

d. Shake a 2-4 oz. volume of santocel C into the separatory funnel and shake again. This should break the residual emulsion and free the benzene so that it can be poured readily from the top of the funnel. If it fails to break, add more santocel C until it does.

e. Pour the benzene solution into the 100 ml. graduate, measure its temperature, then float the hydrometer in the solution and read to the nearest .001 mark, or preferably, estimate to the nearest .0005 with eye held level with bottom of the large meniscus. Don't drop eye lower and read up.

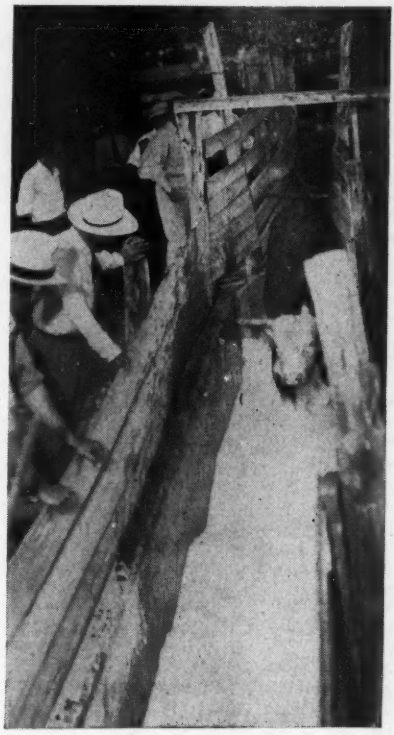
f. From the benzene temperature and apparent specific gravity, choose the proper vat concentration by reference to the chart. (See page 482.)

Precautions:

1. If the vat water temperature is markedly different from the air temperature, the benzene solution will be changing temperature rapidly after placing in the graduate. It should be allowed to reach a point where it will not change appreciably during the time required to remove the thermometer and read the hydrometer.

2. It is good practice to spin the hydrometer slowly in the benzene solution just before or during a reading to prevent possible wall effects.

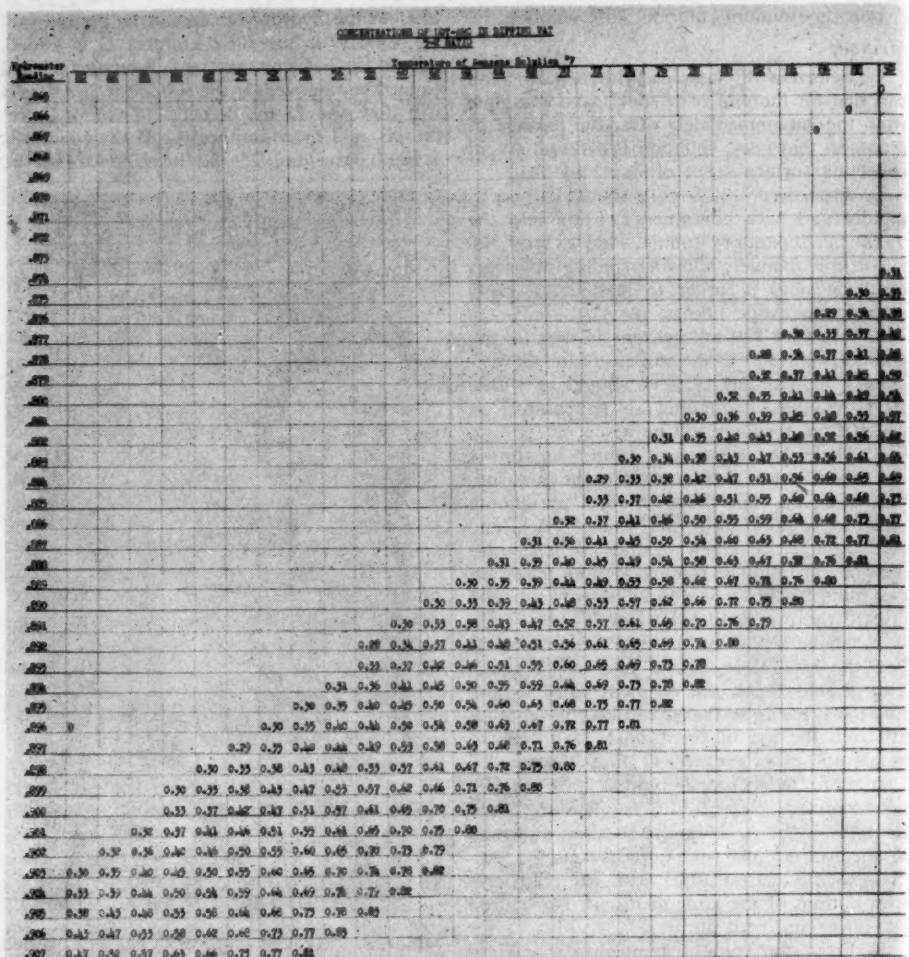
3. If a great excess of santocel C is used to break the emulsion, it is possible to soak up enough benzene so that the 75 ml. required to float the hydrometer cannot be poured out. Conversely, if too little santocel C is added, part of the benzene may remain emulsified and cannot be removed. If the residue in the funnel will flow and 75 ml. of benzene cannot be removed, add more santocel C. If the residue is a rigid paste and 75 ml. benzene cannot be



removed, too much santocel C has been added and the test must be repeated. The 2 oz. volume recommended is a minimum and more may be required, particularly when the vat has been contaminated by the passage of many cattle. Probably the average requirement will be one 4 oz. bottle full, but may exceed this with some commercial insecticides.

Limitations of the Method

The chart illustrated here was made up with a 5:2 ratio of DDT to technical BHC, equivalent to the normal vat concentration of 0.5% DDT, 0.025-0.03% gamma isomer BHC (technical BHC contains 13-15% gamma isomer). If another ratio were used, there would be some error in the results. It would not be great because there is no great difference in the effect of DDT and BHC upon specific gravity.



The method depends upon the selection of a uniform sample from the vat. This is possible only if the insecticide is well dispersed. Inferior formulations that are poorly wetted and highly flocculent in suspension do not permit uniform sampling.

The method is not applicable to a lindane dip or even one of technical BHC alone, such as is used for sheep scab treatment. Use concentrations of this insecticide fall into a specific gravity region of low accuracy.

Field Results

Following successful laboratory studies of the method, it was tried out under field conditions. The initial data are presented here merely to show that the method gives reasonably accu-

(*Continued on page* 484)

Separatory Device For Use In Testing Dipping Baths Containing Organic Chlorides

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THE device described below has been found useful in the several methods that are being used to determine the amount of organic chlorides present in livestock dipping baths to which they have been added. The test has been used chiefly with DDT and BHC mixtures. However, it may be used to determine DDT or BHC singly or to determine other organic chlorides that are used in livestock sprays or dips. Further it can be used to separate any two immiscible liquids.

The methods for the different compounds are based upon the extraction of the organic chloride from a definite portion of the prepared bath or spray with suitable solvent, the addition of an emulsion breaking material to assist in the separation of the solvent, the separation of the solvent by a suitable device, the addition of a dehydrating material, the determination of the specific gravity of the separated solvent by means of a hydrometer and calculation of the amount of organic chloride from the specific gravity indicated.

The device described herein affords a simple means of separating the solvent and is less cumbersome and much less expensive than the funnels, cylinders, etc., hitherto used. Further, it can be constructed at low cost of materials obtainable in any hardware or similar store.

As shown in the illustration, it consists of a bottle, two copper tubes and a rubber or cork stopper. The bottle may be any readily obtainable, wide-mouthed bottle. Its capacity should be a quart or even larger, depending on the amount of sample taken for extraction.

Two holes are bored in the stopper and the copper tubes are passed through them. One of the copper tubes should have a diameter of ¼ in. and should extend from the bottom of the bottle to about an inch above the stopper. The other, or short tube, may be of the same diameter as the longer tube but a slightly larger diameter is preferable. The shorter tube should extend from the bottom of the stopper, to 1 in. above it.

The method for using the apparatus is as follows: A measured portion of the prepared bath is transferred to the bottle. The organic solvent is then added and the stopper bearing the two copper tubes is inserted in the bottle.

The tubes are now closed by placing the ends of the first two fingers over the open tubes in such a way that the short tube is covered by

the forefinger and the long tube by the second finger. The contents should then be well shaken for periods of 25 to 30 seconds.

With the bottle in an upright position, the finger closing the short tube is then lifted to release any pressure that may have developed. Both tubes are again closed and the shaking and releasing of pressure repeated until the contents have been well shaken for the period recommended in the particular method being applied. (Caution—Do not lift the finger covering the long tube. If this is done any pressure that has been built up in the bottle will force liquid out of that tube.)

After shaking, the bottle should be opened, the emulsion breaking material used in the

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method, added, the bottle restoppered and the tubes closed as before.

The bottle is then gently tilted back and forth through an arc of at least 90° two or three times. The bottle and contents are then set aside for from two to five minutes in order that definite organic solvent and water layers may form.

After the two layers have formed, the tubes are again closed by the fingers, the bottle slowly inverted and held in a vertical position until the two layers again form. The solvent layer will be at the top. To recover it, the lower water layer is first removed. To do this the finger on the long tube is removed first, then the finger is removed from the short tube. The aqueous portion flows freely from the bottle through the short tube and is discarded. As soon as the bottom of the solvent layer reaches the stopper, the flow of liquid should be stopped by again placing the finger over the short copper tube and returning the bottle to an upright position.

The stopper is removed and the dehydrating or separating material recommended for the particular method being used is added. The stopper is then returned to the bottle and the contents gently shaken. The separated organic solvent can be poured into a suitable container, its specific gravity taken and the amount of organic chloride calculated in accordance with the directions given for the method being used.

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A Vat-Side Test for Assaying DDT-BHC in Dipping Vats

(*Continued from page* 482)

rate results for the total concentration. Samples were bottled and returned to the laboratory for accurate analysis of the active components at the same time that others were taken for vat-side tests.

COMPARISON OF VAT-SIDE TESTS WITH LABORATORY ANALYSIS

No. of Cattle Through Dip	Laboratory Analysis DDT	BHC	Total	Vat-Side Test Total
8	0.42	0.18	0.60	0.75
100	0.45	0.15	0.60	0.63
200	0.44	0.15	0.59	0.58
300	0.42	0.17	0.59	0.55
400	0.45	0.15	0.60	0.63
481	0.44	0.15	0.59	0.58

When placed in the hands of inexperienced personnel, some difficulties were encountered under field conditions. Reproducible results were not always obtained. With continued practice, however, results improved until the method is now well established in Florida and is being used by state tick inspectors. Some modifications in technic, with improved accuracy and simplicity, are still to be expected.

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2. *Idem* DDT and DDT Combined with Benzene Hexachloride for Control and Eradication of *Boophilus annulatus*. *Am. Jour. Vet. Res.*, 9:270 (July), 1948.

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Treatment of Epizootic Lymphangitis with Formol

All the Greek veterinarians who have had to deal with epizootic lymphangitis to the degree considered of importance to the National Army know how difficult it is, in spite of the most active surveillance and the application of the most rigorous measures, to prevent the spread of this disease and bring about its eradication.

The intravenous injections of mercurials claimed by some as a preventive, not only present some difficulties of practical application but can at the onset confer only a passive protection against the disease. The period of incubation is generally very long and can persist for many months in the litter and stable standings or soil. It is resistant to treatment.

Considering the failure of the various treatments for this disease applied up to the present, a more practical and less severe method has been sought. Thus the intravenous injections of formol, 40% aqueous solution, have been employed.

On a complete clinical examination of a mule of the 73rd brigade (imported by the American Mission) and shipped by their veterinarian the latter part of October 1949, we found irregularly distributed pustules along the course of the shoulder lymphatics, the size varying from that of a pea to a hazel nut. They formed hard nodules, adherent to the skin and opened at a point draining yellowish, thick pus. The corresponding lymphatics formed hard cords, hot and painful, involved the lymphatic ganglions and formed very large tumefactions in front of the shoulder.

Clinical diagnosis of epizootic lymphangitis was confirmed by microscopic diagnosis (*Cryptoccus farciminosis*).

Considering that other veterinarians have tried the latest antibiotics unsuccessfully (penicillin and streptomycin) and these on a large scale and in heavy dosage, search has been made for a treatment more efficacious.

The mule of the 73rd brigade was treated

(*Continued on page* 493)

The Treatment Of Canine Filariasis

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AN intensive program of multiple blood testing for canine filariasis and treatment was instituted in July of 1947, and has continued to date. It has been known for many years that Tidewater, Virginia, the southeastern part of the state, has a fairly high incidence of filariasis in dogs. In fact, the first case of filariasis seen by the author was shipped from Hampton, Va., to the College of Veterinary Medicine in Columbus, Ohio, in 1936. The writer became particularly interested in heartworms and the possibilities of a program of testing and treatment when he was stationed with the United States Army Veterinary Corps in this area. Regulations instituted at that time required that all animals of military personnel stationed at Fort Monroe present their dogs at the clinic for rabies immunization three times at weekly intervals. At the time of each visit, 5 cc. of blood was withdrawn from each animal for examination for heartworm.

Incidence

In 1947, the first year of this program, 303 dogs were presented, all house or yard pets. To accumulate data on the dogs, the following information was requested of each owner: age of dog, breed, place of birth, localities lived in since birth, tests for heartworm, results of tests, and treatment. All dogs were then classified in one of three groups. Group 1 consisted of dogs four to eight months of age which would be expected to be negative as approximately eight to nine months are required for the heartworm to reach maturity; group 2 included dogs over eight months of age that had been in the South less than six months, which would be expected to be negative for the reason given above; and group 3 included dogs over eight months of age that had been in the South over six months, in which group infection is probable.

Results of the original survey were as follows: group 1, 167 dogs, and group 2, 103 dogs, all of which were negative; group 3, 33 dogs, five, or 15%, of which were positive. These included two nine-year-old male Cocker Spaniels born at Fort Monroe, one three-year-old male Wire-Haired Terrier that had been in the South for one year, and two 18-month-old Collies from Fort Benning, Ga. Following treatment with fuadin, the five positive cases were freed of microfilariae.

In 1948, 130 of the original 303 dogs were re-examined, including the five treated the preceding year, which were still negative. Of the 70 re-examined from group 1, eight (11%) were positive; of the 30 from group 2, one (3%), and a like number from group 3, two (7%) were positive. One hundred eighteen new dogs were presented. Seventy-eight were classified in group 1, and 30 in group 2, all of which were negative. Of the ten new dogs in group 3, one (10%) was positive. This one new case was a male Cocker Spaniel, four years of age, from Minnesota, with a history of never having been in the South before this time.

In 1949, due to the large turnover in personnel, only 30 of the original 303 were presented for examination. In these, no new cases had developed. Twenty-one of the 1948 groups were re-examined, and two (9%) were positive. An additional 140 dogs were examined; 65 were classified in group 1, and 35 in group 2, all of which were negative. Of the 40 in group 3, six (15%) were positive. Table 1 summarizes the incidence of infection in the varying age groups and exposure times.

In addition to checking these dogs annually, every animal presented at the clinic during these three years was tested. These dogs from the neighboring communities of Newport News, Phoebus, Hampton, Norfolk, and military installations in the vicinity, were sampled only once a year. In 800 dogs having been in the South over eight months, 154 positive cases, or 19%, were discovered. Some of these animals were as young as 12 months and some as old as 14 years.

However, it is impossible to estimate the frequency of occurrence, even in areas where conditions for transmission are particularly favorable. In one kennel situated in a pine grove bordering a marsh in Chesapeake Bay where mosquitoes are numerous, only 17 of 27 English Setters were positive. Of the ten negative dogs, six were over five years of age. Ten blood samples were withdrawn from each of these negative dogs both night and day, and no microfilariae were ever found. This phenomenon has been noted in several other kennels in the vicinity. In one, there were 15 positive

cases of a total of 17 dogs; one negative dog was six months old, and the other 2½ years old.

Types of Dogs Affected

Whether or not long-haired or short-haired dogs are equally susceptible seems open to question. Brown[1] in his studies on epidemiology of *Dirofilaria immitis* conducted in Georgia, stated that both long and short-haired dogs had almost identical infection rates. Schnelle[2] reported similar findings. However, in the survey described above, 90% of the positive cases occurred in long-haired breeds in the following order: English Setters, Collies, Cocker Spaniels, Pomeranians, Wire-Haired Terriers. Beagles, Pointers, Hounds, Dalmatians and mongrels of the short-haired varieties comprised the remaining 10%.

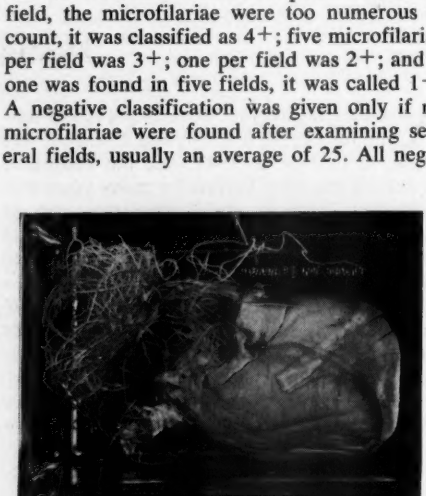
Intermediate Host

It long has been established that infection is transmitted by the mosquito. Fleas have been suspected and have been found infected on dissection, but the role of the flea in transmission is still uncertain[1, 3]. In every positive case in the present study, there was a history of infestation with the American dog tick, *Dermacentor variabilis*. While, to the writer's knowledge, the tick has never been proved as an intermediate host, he has frequently removed ticks and had them subjected to pathological examination. Up to the present time, results have been negative, but it is desirable that further studies should be conducted along these lines.

Diagnostic Procedures

Each blood sample was checked by three methods; direct blood smear, serum, and sedimentation following centrifugation for five minutes. At the end of the first series, no positive cases had been found by the other methods that had not first been determined by direct blood smear. If these results could have been duplicated, examinations for heartworm would have been simplified. However, in the second series, five positive cases were found following centrifuging that had escaped detection by direct blood smear. Since then, the use of Giemsa stain on the blood smear has increased the accuracy of this method to about 98% of the positives found by all methods. The blood smear is prepared, allowed to dry, and fixed with methyl alcohol for two to three minutes. The slide is then placed in Giemsa stain for at least 30 minutes.

Because of the large number of animals examined, a rapid method of classification was developed which, while not as accurate as a count, has proved very satisfactory. A blood smear was mounted, covered with a second slide and examined under low power. If, in one field, the microfilariae were too numerous to count, it was classified as 4+; five microfilariae per field was 3+; one per field was 2+; and if one was found in five fields, it was called 1+. A negative classification was given only if no microfilariae were found after examining several fields, usually an average of 25. All negative smears were also checked by centrifuging the sample. This method was used on 2,226 samples with 5%, or less, margin of error. In suspicious cases, however, sedimentation and centrifugation were always used. In our experience, the time of day the sample was withdrawn had no noticeable influence on numbers of microfilariae found. In studies on periodicity in war dogs, Schnelle[2] pointed out that a variety of patterns has been described by several investigators, and has suggested that routine, particularly feeding time, may affect periodicity.



Canine heart opened to show mass of adult Dirofilaria immitis in the right ventricle and pulmonary artery.

Symptoms

There was no constant symptom pattern. Some animals, positive on blood smear, were asymptomatic, while others were unable to walk. Dyspnea, anemia, emaciation, cardiac disturbances, ascites, epileptiform convulsions, chronic cough, dermatitis, alopecia, and many minor complaints have been noted. While a cloudy anterior chamber of the eye has been noted, no adult filariae have been found in the anterior chamber as reported by Schnelle[4]. The so-called classical symptoms of inability to maintain prolonged exercise followed by collapse, and difficult respiration, have not always been evident. Three Beagles presented one

Monday, had hunted steadily without tiring on Saturday and Sunday, yet they had a 4+ count. It has been observed by others that there is poor correlation between numbers of microfilariae and adults found on autopsy.

Treatment

Treatment was instituted in all cases possible immediately upon detection. There was no attempt to improve the general condition of any of the animals before treatment. During antifilarial treatment, supportive treatment consisted of daily oral administration of ferrous sulfate and vitamin B complex. The diet consisted of 50% beef, 30% dried dog food and 20% whole milk. In addition, multivitamin and liver concentrates were added according to weight and condition. Minimum doses contained 5,000 USP units of vitamin A, 1,000 USP units of D, 1 mg. of B_1 and B_2, 0.5 mg. of B_6, 10 mg. nicotinic acid, 60 mg. ascorbic acid, and 350 mg. of insoluble liver fraction.

Fuadin (sodium-antimony III bis-pyrocatechin disulphonate of sodium — Winthrop-Stearns, Inc.) was used for treatment at the initiation of this program. In all, 57 cases were treated with fuadin, at the recommended dosage intravenously, every other day. The mortality in this group was four dogs, approximately 8%. Fifty-three animals were discharged with no circulating microfilariae following treatments ranging from 24 to 40 days. These animals have been checked at 30-day intervals for eight months. Six dogs, or 11%, again had circulating microfilariae in the blood at 120 days.

The following case report of a severely affected dog showed the most favorable response in this group. A 14-year-old mongrel from Panama was presented with the following symptoms: severe cough, gasping for breath, valvular insufficiency, ascites, and eczema. She was given 0.5 cc. of fuadin intravenously every other day for ten days. During this period, 100 to 200 cc. of serosanguineous fluid were removed by abdominal puncture every three days. Aften ten days, she refused to eat or move. She was sent home with orders to be pampered. In seven days, she was returned and given 32 additional injections of fuadin and five more abdominal taps. At the end of this period, the clinical appearance was remarkably improved; there was a weight gain of five pounds, increase in red blood cells from 5,000,000 to 7,200,000, no ascites; blood was negative for microfilariae; respiration was normal; and heart action was improved. Eighteen months later, she was killed in an automobile accident. Autopsy revealed no adult heartworms nor any circulating microfilariae.

A trial of treatment with caricide diethylcarbamazine (1-diethylcarbamyl-4-methyl-piperazine dihydrogen citrate—Lederle Laboratories) was initiated. An important advantage of this drug is that it is effective orally. As this was a new drug, the approach to the problem was purely experimental. In the early work, the full therapeutic dose was arrived at slowly through the administration of small doses initially. The dosage administered was 2.5 mg./lb. three times a day for seven days, 5 mg./lb. t.i.d. for seven days, and 10 mg./lb., the recommended dose, t.i.d. thereafter. Of the original group of 17 dogs, 14 made complete recoveries and maintained negative blood pictures for eight months or more following the completion of treatment, The average length of time under treatment on this dosage schedule was 36 days, probably because the full therapeutic dose was not administered until the 15th day. Two animals showed marked clinical improvement as evidenced by a gain in weight and abatement of clinical symptoms, but a few circulating microfilariae were still demonstrated eight months following treatment. In these cases, there is the possibility that a certain degree of resistance developed due to the use of low dosage initially. One dog died within eight hours after administration of one dose of 2.5 mg./lb. Autopsy revealed numerous adult heartworms in the heart and lungs, the majority of which were dead.

The following case report is typical of animals treated under this regime. A female English Setter, 29 months of age, weighing 24 lb. with a classification of 4+, was given an initial dose of 50 mg., or 2 mg./lb., orally, three times a day. This was increased to 5 mg./lb. the second week and to 10 mg./lb. in the third week. At this time, a marked drop in microfilariae was noted, and a 10 lb. gain in weight. Treatment was continued for an additional week, at which time the blood was negative for circulating microfilariae, and treatment was discontinued. There was marked clinical improvement. Blood examinations, including smear, sedimentation, and centrifugation, made every 30 days for eight months remained negative.

For purposes of comparison, various dosage regimes were used in subsequent studies. As a result of this experimentation, the optimum therapeutic dose was found to be 10 mg./lb., three times a day, orally. A total of 59 cases have been treated successfully, *i.e.*, all animals have had negative blood pictures for at least six months, and some up to one year, on a 30-day recheck basis. The minimum number of days under treatment to produce a negative

blood was seven, although treatment has always been continued in these cases for at least 14 days. The longest course of treatment was 65 days. It was observed that the length of time under treatment is reduced in direct proportion to the size of the dose administered. To date, eight of the dogs in this group have met death by other causes and have been autopsied at periods ranging from 60 days to five months following treatment. No adult worms were found in either the heart or lungs.

Treatment was unsuccessful in four cases. Two dogs died following administration of one dose of 2.5 mg./lb. However, one animal was treated with a maximum dose of 25 mg./lb., t.i.d., or two and one-half times the recommended dosage, for 81 days with no signs of toxicity. In this dog, there was a great reduction in the number of circulating microfilariae, but one microfilaria has been found consistently. The fourth case was still positive after 32 days of treatment, although a reduction in the numbers of circulating microfilariae had been achieved, and marked clinical improvement noted.

Following the initial dose, vomition may occur, but thereafter, there has been no apparent toxicity to the drug in double or triple the recommended dose. Because of the dangerous location of the adult worms in the heart, heavily infected animals in poor condition present a poor risk for any heartworm treatment. Where large numbers of dead worms might be swept into the pulmonary circulation, there is the theoretical possibility of the occurrence of a sensitization phenomenon with anaphylactic shock due to disintegration of dead worms. In such cases, complete rest and quiet may lessen the likelihood of death. It has also been suggested by Dr. H. W. Brown[5] that coronary occlusion may occur due to killed microfilariae.

To date, 25 dogs have been treated with caparsolate sodium (sodium [p-carbamyl-phenylarsylenedithio] diacetate—formerly caparside sodium—Abbott Laboratories) at the recommended dosage of 1 cc. per 10 lb. of body weight, intravenously, daily for 15 days. As the activity of this drug is against the adult heartworm,[6] particular care has been taken to confine animals under treatment in small runs or cages to limit exercise. Results of treatment with this drug can only be judged on the basis of clinical improvement and return to normal activity. Treatment has been successful in 21 dogs. In two cases, there was marked clinical improvement but the dogs were not sufficiently recovered to perform their normal activities. Two dogs died following the second injection, showing respiratory embarrassment. Autopsy revealed an embolic mass of adult heartworms.

The following case report is included to illustrate a typical experience. A female English Setter became quite ill following the second dose of the drug. There were anorexia and weight loss, and she coughed blood. Treatment was immediately discontinued for two weeks, when treatment was again instituted and 15 injections were administered. While a decided clinical improvement was apparent, at the end of 30 days she still could not withstand any exercise. She was given another course of 15 injections after which she was able to perform in the field for an hour or two, but still could not hunt for a full day. Another course of treatment is being planned at the present time.

There were severe systemic reactions in heavily infected (4+) animals, and severe local reaction following perivascular leakage. In some cases, nausea, anorexia, and laziness were noted for six to eight hours following each injection. In mildly or moderately infected animals, clinical improvement was apparent after one or two injections as evidenced by increased appetite, improved appearance of visible mucous membranes, and increased energy.

Caricide and Caparsolate Sodium, Simultaneous Administration

Because of the rapid reduction of microfilariae following treatment with caricide, and the lethal action of caparsolate sodium on the adult heartworms, a trial of simultaneous treatment was initiated using ten dogs. Both drugs were administered at the recommended dosages —10 mg./lb., t.i.d., orally of caricide, and 1 cc./10 lb. intravenously of caparsolate sodium. All animals were negative for circulating microfilariae in 15 days and all were still negative at a six-month recheck. There were no signs of toxicity in any of the animals treated. An additional 15 dogs have been placed on the same dosage regime. On 30-day recheck, all are still free of circulating microfilariae. Marked clinical improvement has been noted in all dogs treated.

Discussion

Caricide, administered at the rate of 10 mg./lb., t.i.d., orally, has proved successful in freeing the blood of heartworm-infected dogs of circulating microfilariae in approximately 94% of the cases treated. This negative condition has been maintained for at least eight months or longer. Autopsy of 16% of the cases reported revealed no living adult worms in the heart or pulmonary arteries, or circulating microfilariae in the blood. In the author's experi-

ence, it has been nontoxic in double the recommended dose and relatively safe for severely infected animals and poor risk cases. The oral method of administration simplifies treatment, but treated animals should be kept under close supervision.

Caparsolate sodium is very effective in mildly or moderately infected animals. A dosage of 1 cc./10 lb. of body weight, intravenously, daily for 15 days, usually effects a marked clinical improvement. In heavily infected and debilitated animals, a severe systemic reaction may occur. Close confinement during the entire course of treatment and for five days following is recommended, which is the usual recommendation for other antifilarials. Particular care must be exercised in administering the drug to avoid perivascular extravasation, as severe local reaction with sloughing will occur. Therapy must be discontinued at the first sign of the development of respiratory disturbances.

To date, there is no universally successful treatment for use in *Dirofilaria immitis* infected dogs. In my experience, both caricide and caparsolate sodium have given superior results over other treatment methods. Close observation has proved that discriminate use of these two drugs, in recommended therapeutic doses, cause less severe systemic reactions than does fuadin, and there is not the likelihood of loss of sense of smell frequently noted following a course of this agent. During treatment with fuadin, it has been necessary in many cases to send dogs home for several days' rest as the animals have been just too weak to continue treatment. However, both caricide and caparsolate sodium have their limitations and care must be given to the patient at all times during therapy. It is felt that supportive measures are always necessary. Constant supervision during treatment will lessen the possibility of mortality. Frequent blood examinations and occasional hemoglobin and blood counts are also of assistance. Detailed studies on the relationship of hemoglobin and differential blood counts to filarial infections are under way and will be reported at a later date.

Summary

1. An intensive program of multiple blood-testing for canine filariasis, and treatment, over a period of three years, is described.

2. Of 57 cases treated with fuadin, at the recommended dosage, intravenously every other day, 53, or 93%, were cleared of microfilariae following treatments ranging from 24 to 40 days. There were four deaths. On 30-day rechecks for eight months, 47 remained negative, and six, or 11%, were again positive at 120 days.

TABLE 1. SUMMARY OF INCIDENCE OF CANINE FILARIASIS IN THREE-YEAR SURVEY

Year	Dogs Sampled— Total	Group 1 4-8 mo. old Neg.	Group 1 4-8 mo. old Pos.	Group 2* South under 6 mo. Neg.	Group 2* South under 6 mo. Pos.	Group 3* South over 6 mo. Neg.	Group 3* South over 6 mo. Pos.	% Pos.	From Group (s) Examined Previous Years
1947	303	167	0	103	0	33	5	15	
1948	248	78	0	30	0	70	8	11	1-1947
						30	1	3	2-1947
						30	2	7	3-1947
						10	1	10	
1949	191	65	0	35	0	30	0	0	1, 2, 3 - 1947
						21	2	9	1, 2, 3 - 1948
						40	6	15	

*All dogs over eight months of age.

3. Of 63 cases treated with caricide at various dosages, orally, 59, or 94%, were negative in seven to 65 days, and have remained so on recheck at periods ranging from six months to one year. Two dogs died following a single dose of 2.5 mg./lb., while one dog has been on treatment for 81 days at a dosage of 25 mg./lb., or two and one-half times the recommended dose, t.i.d., without showing any symptoms of toxicity. In a fourth dog, there was marked reduction in microfilariae and definite clinical improvement following 32 days of treatment. The optimum therapeutic dose was found to be 10 mg./lb. of body weight, t.i.d., orally.

4. Of 25 dogs treated with caparsolate sodium, at a dosage rate of 1 cc./10 lb. of body weight intravenously, 21, or 84%, have returned to normal activity. Two dogs died following the second injection, and in two, there has been marked clinical improvement. Severe systemic reactions occurred in heavily infected animals and severe local reaction followed perivascular leakage.

5. Ten dogs were treated with a combination of caricide and caparsolate sodium at the respective recommended dosages. All animals

(*Continued on page* 491)

A New Approach To The Management Of Ammonia Dermatitis And Related Wounds

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"IF it is safe for my baby, it must be safe for my dog." Applying this trite theory, extensive studies have been conducted with three diaperene* products to determine their adaptability to animal patients. Using established human therapy as a guide, two age groups were considered; young children, and bedridden, incontinent adults. The most common skin condition in children of the diaper age is ammonia dermatitis. This usually affects the areas covered by soiled cloth, such as buttocks, genitalia, and the lower abdomen. The cause of ammonia production is due entirely to bacterial decomposition of urinary urea into free ammonia. The principal organism concerned is *Bacillus ammoniagenes,* a saprophytic gram-positive bacillus which originates in the feces and infests the skin. When wet by urine, a good culture medium is furnished with a favorable temperature for its growth, and abundant ammonia production follows[1].

The bedridden adult becomes a subject of concern under two classifications; convalescent patients following genitourinary surgery (in these, drainage contains urea) and a second and much larger group, the aged senile incontinents. A possible third group, not so important in human nursing as in veterinary medicine, are those with heavy body casts. Pressure against the skin over bony prominences, poor circulation, and the continuous bathing of the body in fluids predispose tissue to invasion.

Pathological Aspects Cited

Prophylaxis requires means directed against the contributing causative factor. Where the skin, dressings, and bandages are urine-soaked and remain in prolonged contact with tender cutaneous areas, especially under pressure, bacterial infection is hastened. Fecal contamination of wounds, contusions, abrasions, or the unbroken skin, may lead to bacterial infection. Diaparene has been found effective against *B. ammoniagenes* and *Staphylococcus aureus;* patch tests on children evidenced no skin sensitivity[2]. Further tests in extremely high dilutions proved diaparene to be bactericidal against the following: *Proteus vulgaris, Streptococcus fecalis, Pseudomonas pyocyaneus, Alcaligenes fecalis, Aerobacter aerogenes, Streptococcus viridans, Escherichia coli, Streptococcus pyogenes*[3].

Prophylaxis and Therapy Available

Diaparene is available in three forms, each containing the same active ingredient, but, due to various vehicles, having different application. The tablet form was first produced to sterilize baby diapers. These were soaked in a solution made with the tablets (one tablet to one pint of warm water makes stock solution), before drying. The same principle may be used for surgical dressings. Practitioners have found some considerable advantage in using treated, then dried, body bandages following abdominal surgery.

The large animal practitioner will find it advantageous to medicate his foot dressing cloths and leg bandages in the manner just described.

The second form of the subject medicament is the water miscible ointment. The main general objection found in veterinary usage of the ointment is that it is not sufficiently adhesive to hairy surfaces. However, since it is recommended for use on shaved surfaces and hairless areas, this objection is not a major one. It is particularly adapted to the shaved limb, under cotton, over which an orthopedic cast is applied. One such application is generally sufficient to inhibit bacterial growth for the period of immobilization under cast or for approximately two weeks. Of special note is the application of diaparene ointment to the ventral surfaces of newborn pups showing the characteristic sores and blemishes occasionally mistaken for dietary disturbances. Certain "swamp rashes" of retrievers have been found to respond to a few applications of the ointment

*Diaparene is para di-isobutyl-eresoxy-ethoxy-ethyl di-methyl benzyl ammonium chloride monohydrate, supplied by Homemakers Products Corp., New York City.

massaged into the skin of the axillary and abdominal regions.

The third, and most recently developed form, is a mentholated diaparene dusting powder. This appears to be the most versatile for the veterinary profession. It has prophylaxis as well as treatment value, plus the fact that hairy areas need not be shaved. This dusting powder can be used in every instance that one would employ a first-aid powder or antiseptic dressing. This is one quaternary ammonium compound found non-toxic to cats. It is superior to the sulfonamide dusting powders from the bactericidal standpoint. It is swifter acting and longer lasting than the nitrofurazone group of agents, and does not cause corrosive action or scar formation as is the case with certain permanganates, cresols, phenols, and the related antiseptics. It has not been found to retard healing in any domestic animal. In both large and small animals that are down for any length of time, it is of value to apply one of the three forms to prevent decubital sores. In large animals, it is economical to use washes of a prepared solution. In pets, the ointment will be satisfactory on denuded spots. A novel yet important use of the ointment is in control of the universal affliction of rabbits known as "sore hocks." Sometimes a considerable economic factor in commercial hutches, and laboratories.

Versatility of Therapy Cataloged as to Cases

This preliminary study has been so satisfactory that the medicaments discussed are being adopted for routine treatment of all fractures placed in casts, and in the preparation of all surgical bandages. The dusting powder may well replace the host of conventional preparations used for surface dressings. Diaparene does not interfere with neutral healing agents. This product, in one of its three forms, has been used on approximately 100 animal cases. The following groups of dermatosis are reported:

1. *Simple ammonia dermatitis, 60 cases*: Applications, generally once daily, with the type diaparene used being determined by the nature of the affected area and the animal on which it was to be employed.

2. *Pustular dermatitis, two cases*: *"swamp sores," six cases*: Scrubbed with solution on the first day, then applied ointment for three or four consecutive days as needed.

3. *Rabbit sore hock, 20 cases*: Same procedure as described for 2.

4. *Rope burns (equine), three cases*: Wet packs of the solution to affected fetlock area renewed once daily as needed.

5. *Equine dermatitis eczematosa (scratches), ten cases*: Same procedure as rope burn.

Not included are those animals which were dressed with dry cloths, which had been treated with the solution of diaparene.

In all, 40 dogs, 15 cats, 20 rabbits, two sheep, three cows, 15 horses, one pig, one canary, and one bluebird received treatment with one formulation or the other as indicated.

Summary

Diaparene is universally accepted by the medical profession, and may be adapted for use by veterinarians. It is versatile, non-toxic, without contraindications, and does not interfere with healing. Its availability in three forms enhances the range of its usefulness. It is the modern approach to the management of ammonia dermatitis and related wounds.

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The Treatment of Canine Filariasis

(*Continued from page* 489)

were negative for circulating microfilariae in 15 days and at six-month recheck.

6. Heavily infected animals in poor condition are poor risks for antifilarial therapy.

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Wool production in the United States for 1949 amounted to 253,350,000 pounds, a serious reduction when contrasted with the 1938-47 average of 407,844,000 pounds.

Avian Keratoconjunctivitis*

GEORGE P. FADDOUL,** D.V.M., and R. C. RINGROSE,** Ph.D.,
Durham, New Hampshire

THIS investigation was undertaken for the purpose of contributing to the knowledge of a certain idiopathic ocular disorder affecting young chickens. During the past few years the numerical incidence of this disease has increased, a fact for which there is no sure explanation. During the winter of 1949-50 its wide and expanding distribution was the subject of great alarm and much discussion among poultrymen in some of the New England states.

The observations of Bullis, Snoeyenbos, and VanRoekel[1] first contributed to the present knowledge of this disorder. They suggested that "Factors associated with the environment appear to be responsible for the disturbance. Changes in poultry rearing practices which have permitted an increase in the liberation of ammonia from the litter appear to be contributory."

Studies were, therefore, carried out to test the hypothesis that ammonia vapor is a factor responsible for this ocular disorder.

Experimental

Attempts to transmit or to isolate an infectious agent from naturally occurring cases of keratoconjunctivitis have been noncontributory. It is our desire to report the fact that we were successful in producing ocular lesions which were considered to be identical to those observed in naturally occurring field cases.

The main objective of the experiment was to determine, under simulated natural conditions, whether this ocular disorder could be reproduced experimentally. The entire experiment was carried out twice, with 20 four-week-old New Hampshire chickens in the first and eight nine-week-old New Hampshire chickens in the second trial.

Attempts to reproduce symptoms experimentally were conducted in two small, closed rooms. In both trials, all of the chickens were caged on the same level in one battery unit. In the first trial, the chickens were subjected to ammonia vapor which was liberated from a carefully calculated quantity of ammonium hydroxide, (reagent grade) containing 28% ammonia. A sufficient quantity of ammonium hydroxide was poured, twice each day, directly on the dropping pan in each battery unit, to maintain approximately a 0.1% concentration of ammonia by volume in the air of the closed room. After two weeks of continuous exposure to ammonia vapor the chickens failed to exhibit any visible evidence of ocular injury. At the end of the second week the concentration of ammonia was increased to approximately 0.2% by volume. This concentration of ammonia was continued for an additional three-week period.

Ocular lesions first became apparent after

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**Poultry Department, University of New Hampshire, Durham.

four weeks of continuous exposure and were quite severe at the end of the fifth week. During the initial breakdown, a slight cloudiness of the cornea was observed, which was soon followed by a hazy ground-glass appearance to the external surface of the eyeball. In the severe cases, a keratitis developed with the formation of a round, ulcerous area on the cornea, which was generally accompanied by a marked inflammation of the conjunctiva. A total of 18 of the 20 chickens subjected to ammonia vapor exhibited varied degrees of ocular lesions.

In the second trial, another isolated room was used to preclude the possibility of an infectious agent. The ammonium hydroxide was poured three times each day at about eight-hour intervals. The concentration of ammonia in the air was calculated so that approximately a 0.1% by volume would be maintained in the room. Ocular injury first became apparent after three weeks of continuous exposure and was quite severe at the end of the fourth week. The ocular lesions reproduced in this trial were identical to those just previously described. The entire group of eight chicks subjected to ammonia vapor exhibited varied degrees of ocular lesions. No deaths occurred in either of the above-mentioned trials.

Summary

A study is reported concerning the influence of ammonia vapor upon the normal eyes of young chickens. In two groups of chickens sacrificed, four and nine weeks of age, it was observed that an ocular disorder clinically resembling, if not identical to, naturally occurring cases of keratoconjunctivitis was reproduced experimentally. This fact was taken to incriminate ammonia vapor as being responsible for this ocular disorder. The present experiment confirms the earlier observations concerning the possible effects of ammonia liberated from the litter upon young chickens.

Acknowledgment

It is a pleasure to acknowledge the technical assistance of Henry A. Davis, Research Assistant Professor of Agricultural and Biological Chemistry.

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Sheep are susceptible to all three strains of tubercular organisms, bovine, avian, and human.—*A. W. Deem, D.V.M.*

Treatment of Epizootic Lymphangitis with Formol

(*Continued from page* 484)

with formol, intravenous injections of 5 cc. of 40% solution in 25 cc. distillled water. These injections were repeated every two days for 20 days, so that this mule received by vein, 50 cc. of formol (40%). The result was surprising. All the characteristic symptoms shown by this mule (corded lymphatics, pustules, etc.) disappeared completely. Cure was obtained in a period of 50 days.

Naturally, these injections, due to the large dosage, are followed at the start of treatment by violent colic, which diminishes in the course of the treatment. The same results have been obtained in this hospital with a dozen other patients suffering from the same infection in different stages. The results appear to be most favorable and these have been interesting and singular.

In view of the economic importance that this treatment could have, it would be interesting to have confirmation of the results here reported. Thus, it is hoped that the Major-Veterinarian Georgiadis and Captain-Veterinarian Vardakas of the 15th Mountain Division, who have supervised these experiments, will again start to use them on the mules imported into Greece by the American Mission to Aid of Greece (A.M.A.G.).—*Michel Hidiroglon, Salonika, Greece.*

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In an original survey, 3.5% of a large group of people were reported to be hypersensitive to penicillin. This work was done early and before this antibiotic was in widespread use. Now, report is noted that 10 to 12% of another large group in the Chicago area are sensitive to this agent. This observation confirms the fears of many that the promiscuous use of penicillin is responsible for the development of hypersensitivity and likely resistant pathogenic bacterial strains. The value of this agent for the treatment of infections by susceptible organisms is lost for a significant segment of the total population.

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The injection of 150 mg. of streptomycin in 0.6 cc. of sterile distilled water directly into the infected sinuses of turkeys is reported to be followed by remarkable results; approximately 90% of cases of sinusitis respond satisfactorily. The exudate is not removed from the sinus.

Sick Greyhounds - - - A Poor Bet*

ROBERT M. BURTT, Miami, Florida

HOW many times has a Greyhound been blamed for running a bad race when he actually was sick? How many times has a young Greyhound been ruined, or at least forced to undergo a longer siege of illness than necessary, because he was run when he was ill or in the incubation stage of a disease? If the truth were known, the number is legion.

You will say that a Greyhound shouldn't be run when he is sick. No one will argue that point with you. But suppose no one knows the dog is sick, not even the owner or trainer?

That's impossible, you say. Wait a minute . . . Let's take a case from the records.

Let us go to the Middle West to one of the largest Greyhound breeding farms in the United States. The owner of this farm has been raising and racing Greyhounds for many years. The incident about to be related happened during the early fall when the owner was present, not when he was away at a track. The weather had been ideal for several weeks previous. There were 100 Greyhounds of all ages on the place from a litter just born to the oldest breeding stock. In addition, all the active race dogs were at the farm.

There was a litter of six older pups in one outside run, one female and five males. They were all sturdy, stout-limbed, well developed, ranging in size from the female's 61 lb. to 76 lb. for the largest male. Like most pups they were full of life, seldom still an instant, running and playing back and forth in their run, barking at the other pups in the runs on either side.

At the moment this incident begins there was no suspicion of sickness of any kind on the farm.

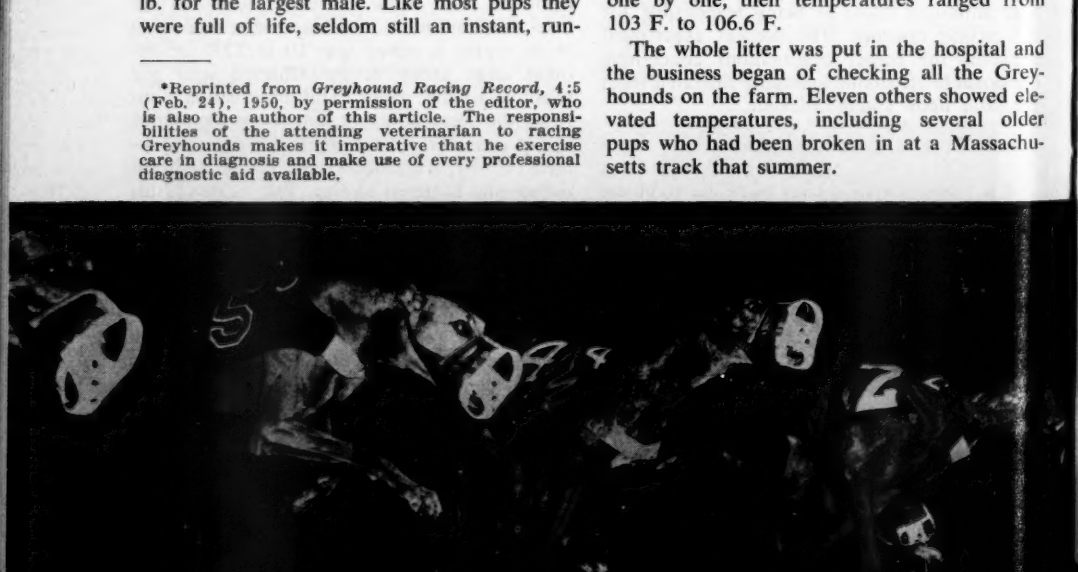
On a certain late afternoon the female in the litter above referred to ate only half her food. Her brothers gulped down their feed as usual. During the day she had acted normally, playing with and chasing her littermates. To an experienced kennel operator this deviation from the normal—eating only half her feed when she had previously made away with it in short order—is an alarm signal. It might be well to add that this litter—as well as all others—had previously been inoculated against distemper and had shown excellent reactions. In this particular case distemper does not enter the picture.

After feeding was over, the female was taken out of the run and her temperature checked. She looked all right and acted all right. Her temperature was 106 F.

The owner immediately isolated the female in the hospital room and phoned his veterinarian, who came at once. The first step taken was to check the temperature of the five males in the litter. Although they were frisking and playing when they were taken out of their pen, one by one, their temperatures ranged from 103 F. to 106.6 F.

The whole litter was put in the hospital and the business began of checking all the Greyhounds on the farm. Eleven others showed elevated temperatures, including several older pups who had been broken in at a Massachusetts track that summer.

*Reprinted from *Greyhound Racing Record*, 4:5 (Feb. 24), 1950, by permission of the editor, who is also the author of this article. The responsibilities of the attending veterinarian to racing Greyhounds makes it imperative that he exercise care in diagnosis and make use of every professional diagnostic aid available.



To make a long story short, the trouble was diagnosed as leptospirosis and the probability seems that it was contracted at the track and brought to the farm. It was the veterinarian's opinion that some of the dogs affected had been running a temperature for several days, if not a week, despite the fact they were eating and acting normally in every way.

It seems incredible that a Greyhound, or any animal for that matter, can act normally for days while being sick either with or without a fever, but experienced trainers are quite aware it is possible and, in fact, happens quite often.

Several years ago an owner broke in a wonderful prospect on a Florida track. This young dog might have become a real champion. He broke the box like a bullet and held his speed well beyond a five-sixteenths. He won his first two races, was second his third race, although running with experienced dogs just below the hot box.

The next start, he left on top as usual but weakened badly coming home. Although the dog ate his feed normally when he was returned to the kennels, the owner noticed, in taking off his wire muzzle following turn-out, that his nose was hot and dry. Not liking this, he decided to take the dog's temperature. It was almost 107 F. He got a veterinarian at once who stated that it was his opinion the dog had been sick several days although he hadn't shown it. He further stated he was afraid the race run that night had taken so much out of the dog that it might be difficult to save him. He knew what he was talking about for the dog was dead in seven days.

In the first two cases the disease was diagnosed. Now let's take a different case, one involving a Greyhound known all over the world.

On February 1 this year, Beach Comber, Paul Sutherland's famous champion, ran in a four-dog match race. He finished fourth, a most disappointing exhibition for a Greyhound of his caliber. Two days later he ran again and although he finished second his effort was very unimpressive. He was scheduled for another exhibition race on the following Wednesday, February 8. On Tuesday morning, the day before, Sutherland became slightly suspicious of Shorty, which is Beach Comber's kennel name.

The reason for such a feeling on the part of dogmen is sometimes difficult to explain, particularly when there are no definite symptoms, nor noticeable departure from the normal. However, any owner would be unusually sensitive about the condition of a Greyhound as valuable as Beach Comber. The dog's appetite had been good and a thorough examination by Sutherland revealed nothing except a temperature of slightly over 102 F., not unusual in an old dog who had just come in from the exercise pen. The only physical sign Paul could notice

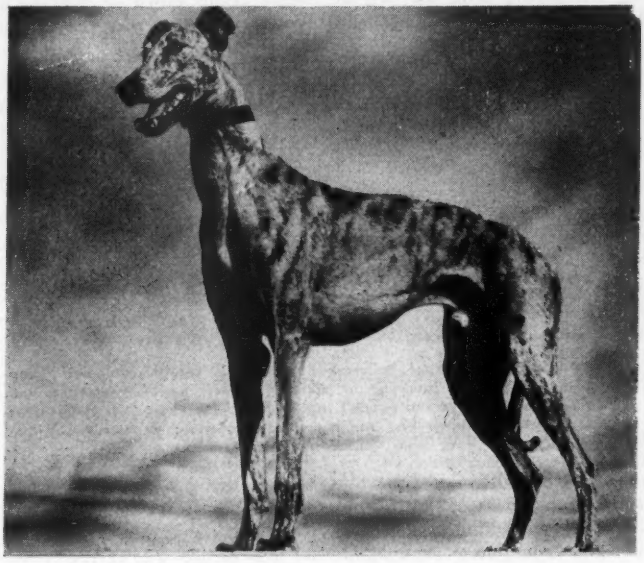


Fig. 1. Had it not been for the alertness of Paul Sutherland, owner of Beach Comber, shown in the above photo, the internationally known Greyhound might have run a race to his own detriment and the disappointment of a huge number of his followers.

was that the dog's skin didn't look quite right.

Sutherland believes in taking advantage of all aids medical science can give and his dogs have their hemoglobin, red and white cell counts, and other routine laboratory tests, made at regular intervals. It so happens that Beach Comber's blood had been checked the week before and his white count had been subnormal, although the week before it had been normal.

Not being able to put his finger on anything definitely wrong, Sutherland took the dog at once to the laboratory. Imagine his amazement and that of his veterinarian when Shorty's white count had suddenly zoomed to 19,000.

Obviously there was some kind of an infection in Beach Comber's system. Immediate steps were taken to prevent the dog from becoming dehydrated and to knock the infection out by proper medication. As a result, 48 hours later, his white count was down to 6,200, which is on the low side. Two days later it was around 8,000. However, Beach Comber has always been a trifle low, averaging 9,000.

Much as Sutherland hated to, in view of the public's desire to see Beach Comber run, he had to ask that his dog be scratched. It would not have been fair to the people who would have bet on him and it certainly wouldn't have been fair to the dog.

There was another case of a very fine young Greyhound who started out like a house on fire, winning several races and winding up in the hot box. Then he seemed to go sour, wouldn't break nor run after he got out of the box. He ran several miserable races and finally turned his head badly, taking another dog clear to the outside rail.

The owner got a lot of quick advice. The dog was no good anyway, it was a surprise he hadn't fought before, might as well send him to the gas house right away. No use to feed him any longer. So the owner took him to his veterinarian to put to sleep. The veterinarian took the dog, but being of a curious nature he made some laboratory tests first. He found the dog had a white count of 26,000, the red count was below 4,000,000, abnormally low, and the dog's hemoglobin was 55% when normal is 95%. The dog was shockingly anemic.

The dog was treated for several weeks. Infection was brought under control and the white count down to normal with penicillin. When the dog was ready, the veterinarian called the owner and showed him the dog, telling him to try again, and that he didn't owe a cent if the animal wouldn't run.

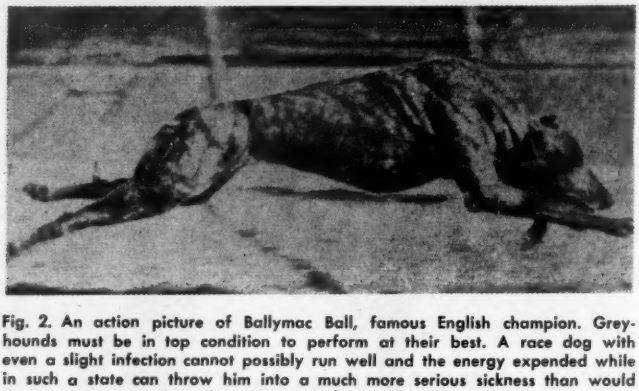


Fig. 2. An action picture of Ballymac Ball, famous English champion. Greyhounds must be in top condition to perform at their best. A race dog with even a slight infection cannot possibly run well and the energy expended while in such a state can throw him into a much more serious sickness than would have been the case if he had not run.

The owner was skeptical but took the dog, worked him, schooled him. The dog ran a powerful race and was entered for official races. He won three in a row and was soon back in the hot box and never turned his head again.

It is positively amazing to see how willing the majority of owners and trainers are to condemn a Greyhound, young or old, who turns his head. His father or mother must have been a fighter, or if they weren't, he's a throw-back to some ancestor who was, even if the ancestor lived in an age before tracks were known.

Some owners and trainers are willing to give the dog the benefit of the doubt and they try to find out if there is something wrong. But many give only a superficial examination. There is little doubt that each year hundreds of Greyhounds can be salvaged by more thorough and painstaking methods. Far too few owners and trainers are willing to go to the trouble and expense of a modern, up-to-date clinical examination. But what is $20. or even $50. if a dog worth $1,000. or more can be saved?

Let's make sure a Greyhound is not sick before we say he is no good.

EDITORIAL COMMENTS

No Extra Pay for Military Veterinarians

Most, if not all, of the recent newspaper articles and news radio announcements concerning the "Doctor Draft" law (Public Law 779—81st Congress) have either stated or implied that veterinarians who may apply for appointment and volunteer for active duty with the Army or Air Force Veterinary Corps Reserve are, like Medical and Dental Corps officers, entitled to receive $100. per month additional pay. Such announcements were not correct and were not in accord with official military news releases. These newspaper accounts seem to have left many readers with the impression that the additional pay provision is something of recent origin and connected with the Public Law referred to above. Such is not the case. Following World War II, a severe shortage of Medical and Dental Corps officers developed. In 1947, the Regular Army components of these corps were at less than 50% of the strengths authorized by the Officer Personnel Act of 1947, and it was impossible to get sufficient reserves to volunteer for active duty to meet the Army's needs for physicians and dentists. The Army Integration Programs of 1946 and 1947 had resulted in filling the Regular Army Veterinary Corps to its authorized strength, but was not successful in the cases of the Medical and Dental Corps. In a further effort to meet the military needs for additional personnel, both regular and reserve, for the Medical and Dental Corps of the Army, Navy, and Public Health Service, Congress passed the bill, Public Law 365—80th Congress, which provided that officers of these corps would receive $100. per month additional pay. The law also provided for direct initial appointment in the regular component of these corps in grades up to and including Colonel in the Army and Captain in the Navy. Inasmuch as there was no shortage of personnel in the Regular Army Veterinary Corps and there were adequate reserves on active duty, an effort to have the Veterinary Corps included within the provisions of the bill was, for lack of a convincing sustaining reason, not favorably received by the Congress.

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All antibiotics, except chloromycetin, give growth response in some classes of animals.

Name Animal Protein Factor (APF) Discontinued

What the feed industry has been calling animal protein factor (APF) supplement for the past two years is now officially defined as vitamin B_{12} supplement. The name APF has been discontinued.

The term originated from the fact that there are some factors in animal proteins which are essential for reproduction, hemoglobin formation, and rapid, early growth in young chicks, pigs, dogs, fur animals, and some other species. Two years ago research proved that the factor was a water-soluble vitamin and not an animal protein. Later work has indicated that vitamin B_{12} produced the most pronounced effects which could be attributed to APF. It has also been shown that there are other vitamins in this group. Products that have appeared on the market as concentrated sources of vitamin B_{12} were produced largely by a fermentation process. Some are by-products of antibiotic production.

A few months ago it was found that a group of antibiotics were responsible for growth stimulation. These agents constitute, as a group, a second class of substances that, though closely related, produce separate effects. Both give growth response when fed to certain species of experimental animals.

At the meeting of feed control officials in Washington last month, new definitions were adopted to help clear the confusion in mixed, labeled feeds. Henceforth the term vitamin B_{12} will be used instead of APF on such feed only as added. The amounts added will not be given. Sources of the vitamin must indicate its unitage.

The term "antibiotic feed supplement" will be used for those feeding materials which are used for their antibiotic activity. Labeled feed will indicate only that it is added. Feed manufacturers will purchase these materials, either singly or in combination, on a guaranteed unit basis for inclusion with various formulae.

Positive answers to questions continually asked regarding these growth stimulating substances await the results of extensive research work now in progress at agricultural colleges, experiment stations, and private research farms.

Differential Diagnosis of Foot-and-Mouth Disease Types and Vesicular Stomatitis

Test animal inoculations for differentiating foot-and-mouth disease and vesicular stomatitis have been replaced largely by the complement fixation test. Virus types of foot-and-mouth disease may also be determined rapidly by means of this laboratory procedure. Diagnosis is made on the observation of the behavior of vesicular material against hyperimmune serum.

Cattle, swine and guinea pigs can be infected with all three of the virus types (A, O and C) of foot-and-mouth disease, in quick succession. Each type immunizes animals against itself, but not against the others. This explains observations of this disease striking twice in the same herd in a single season. Having available guinea pigs immunized against each of the virus types, inoculation of the virus to be typed will be indicated by the animals protected against the experimental inoculation. Hyperimmune serum of guinea pigs immunized against each of the viruses provides the necessary serum for the complement fixation test.

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Foot-and-Mouth Disease Laboratory Abandoned

After having previously approved the project, Congress now has refused the money to build the foot-and-mouth disease laboratory requested by the Department of Agriculture.

Last year, Prudence Island, in Narragansett Bay, separated by navigable waters off the coast of Rhode Island, was selected as the construction site. An appropriation of $500,000. was made to secure options and prepare plans for this vital research center. According to report, further action is deferred because of congressional lobby by local groups in Rhode Island whose indignant protests that the laboratory would constitute a menace to public health was concurred in by the Congress.

In the meanwhile, no experimental work can be done on this highly contagious and devastating disease in this country. The failure to prepare against an existing threat to the health of animal and meat food supply is regrettable and ill-considered.

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The establishment of microorganisms in the rumen of calves is dependent on the provision of adequate quantities of good roughages.

Dr. John S. Koen Victim of Heart Attack

Dr. John S. Koen, 69, well known veterinarian and authority on swine disease, died October 4, 1950 at the Illinois Masonic Home, following a heart attack.

Dr. John S. Koen

Doctor Koen received his academic training at the Kansas City Veterinary College, graduating in 1907. Immediately afterward he entered the BAI and subsequently served as one of the first three veterinarians assigned to hog cholera control work at the Ames station. In 1916, he was given charge of the Bureau's force in Iowa and while there, was the first to recognize, describe and name swine influenza and to point out its apparent relationship to human influenza.

In 1931, Doctor Koen was named to inaugurate and organize a municipal milk and meat inspection service at St. Louis, Mo. The resulting established service was without a rival for efficiency among American cities. The complete food inspection service developed through his efforts was generally accepted as a model of what such a service should be. He served as chairman of the A.V.M.A. Special Committee on Meat Hygiene (1934-35) and as a member of the Committee on Meat and Milk Hygiene of the United States Livestock Sanitary Association. In the fall of 1934, he re-entered the BAI meat inspection service and in 1936 was reassigned to hog cholera control work in Storm Lake, Iowa, where his health failed.

Doctor Koen's life was characterized by unstinted, loyal service, from which came accomplishments of merit that added to the advances made in veterinary science during the first half of the century.

New Veterinary Clinic at Minnesota

The importance of animal health in the agricultural economy of Minnesota is recognized by the legislators of that state. Just four years ago, plans were evolved and money appropriated to establish a veterinary school. Included in these plans were funds for two new buildings; one the Veterinary Clinic which was dedicated by appropriate ceremonies on the Minnesota University, St. Paul, campus, October 25. At these ceremonies Dr. William A. Hagan, dean of the New York State Veterinary College, gave the principal address.

Dr. W. L. Boyd

The practical and utilitarian structure in the accompanying illustration has materialized from the drafting board of planners. Built at a cost of $710,000., it is 169 feet wide and 306 feet long. It consists of two stories; each on its ground level. The upper floor is devoted to small animal clinic, surgery, pharmacy, hospital wards, laboratories, classrooms and offices; the lower floor to facilities for the treatment and hospitalization of large animals, autopsy room, feed storage, etc. The building contains approximately 100 wards, two examination rooms, a surgery room for small animals; two large operating rooms for large animals; two pharmacies; and 20 stalls each for cattle and horses. *X*-ray and other equipment is complete for all units. Isolation areas include both stalls for farm animals and a ward for pets.

The University offers two years of preveterinary medical training and four years of professional training. Today, the professional school has an enrollment of 172, including 52 freshman, 50 sophomores, 47 juniors, and 23 seniors. The class of 1951 will be the first graduated. There are 25 veterinarians in the University's graduate school. In addition, about 150 students are taking preveterinary work.

This new School of Veterinary Medicine, established in 1947, is headed by Dr. W. L. Boyd as director. It is a part of the College of Agriculture, Forestry, Home Economics and Veterinary Medicine. The school also works closely with the School of Medical Science on the Minneapolis campus.

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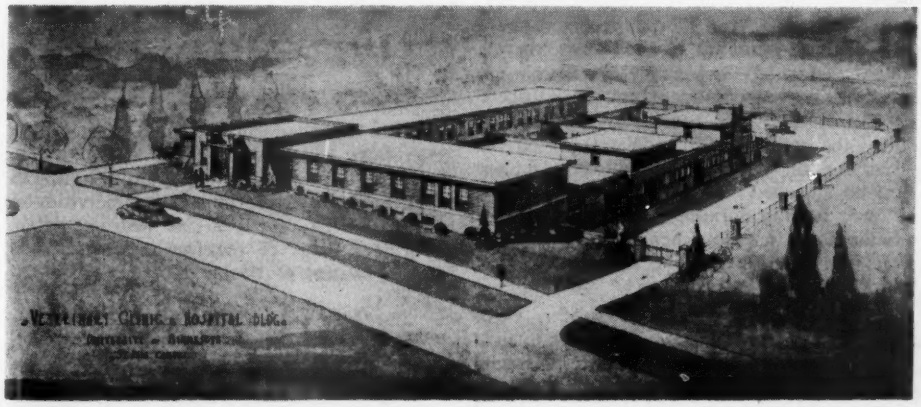
Because of the possibility that heads of poultry treated with stilbestrol implants might be responsible for mink breeding problems, a warning was issued to fur farmers against the use of chicken waste for feeding breeding stock. It has been found that the residue of pellets may interfere with reproductive processes in mink when chicken heads constitute an appreciable portion of the diet.

Although no specific information is available, practitioners are reminded to keep the possibility in mind that dog foods prepared from poultry wastes may be responsible if breeding problems arise in pet animals.



Status of Former Army Veterinary Corps Officers

Many veterinarians who have served in the Army are uncertain as to whether they still hold reserve commissions. The following information from the Surgeon General's Office, Department of the Army, should answer most questions on the subject.

The key to whether an individual once commissioned holds a reserve commission lies in his letter of appointment. If the letter states that the appointment was made under Section 37, National Defense Act, as amended, sets forth the grade, serial number, and effective date, and states that "by direction of the President you are appointed in the Officers' Reserve Corps"—he holds a reserve commission and it is still effective, unless notice of termination has been received from the Adjutant General.

In addition, some of the older letters of appointment do not mention Section 37, etc., nor Officers' Reserve Corps. However, they do mention that the appointment is in the Reserve, in connection with the individual's name, rank, and corps, (*e.g.*, John Smith, 1st Lt. Vet. Res.) Holders of such letters of appointment also hold a reserve commission and it is still effective unless officially terminated.

Appointments in the Officers' Reserve Corps are for five years, subject to renewal. During the war all reserve commissions were automatically extended for the duration of the emergency, plus six months. Since no official declaration has been made ending the emergency such commissions are still in force, with the exception of those which have been terminated through resignation by the individual and acceptance by the government or termination for cause or convenience of the government.

During World War II, many persons were commissioned directly in the Army of the United States (AUS). These commissions do not constitute appointment in the Officers' Reserve Corps. AUS commissions authorized during the period of World War II, under the provisions of Section 37, National Defense Act, as amended, are valid and will remain in force for the duration of the war and six months thereafter. All other AUS commissions were terminated by Public Law 239 of the 80th Congress.

If the letter of appointment or other pertinent papers have been lost and the individual is still uncertain of his reserve status, he should write directly to the Adjutant General of the Army, Attention: Reserve Branch, Washington 25, D. C. The letter should contain a direct request as to whether the individual holds a reserve commission and, if so, whether the commission is in force at this time. The letter should contain the writer's Army serial number.

Any statement to an individual concerning his reserve status or non-status which comes from any source other than the Adjutant General is not official.

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Colonel Harold E. Egan, Regular Army Veterinary Corps (Retired) died in Walter Reed General Hospital, Washington, D. C., on October 18, 1950.

Colonel Egan was a graduate of the Medical Field Service School and an honor graduate of the Army Veterinary School in 1925, and served as director of the latter school from 1931 to 1935. During World War II he served as veterinarian of the Seventh Service Command, and from December 1946 until November 1949 was theater veterinarian in Europe. He was awarded the Victory Medal in World War I and World War II, the Commendation Ribbon, and the Legion of Merit on March 9, 1946 for outstanding service as Seventh Service Command Veterinarian. At the time of his death, Colonel Egan was residing at 4905 Potomac Avenue, N.W., Washington, D. C.

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Dr. Charles F. Keane, 76, California's second state veterinarian and for 40 years an official in the Department's Division of Animal Industry prior to his retirement from state service in 1944, died October 19.

Doctor Keane was appointed state veterinarian by Governor George C. Pardee in 1904, succeeding Dr. Charles H. Blemer, first to fill the office of state veterinarian in California.

He was state veterinarian when Texas fever, sheep scabies and glanders were widespread in California. Under his guidance California became the first state to use new dipping methods for treatment of cattle affected with fever ticks and the state became the first to be released from federal quarantine. Millions of sheep were dipped under his supervision to control scabies. He was also instrumental in securing passage of the first state legislation on the control of bovine tuberculosis.

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Tissue fluid levels of antibiotics are higher than blood level determinations indicate and persist for longer periods.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

Frequently, biological literature records the transplating of a fertilized ovum from a female originally impregnated to another of the same species. In some laboratory animals, rabbits for example, this, with the subsequent birth and rearing of young, has been accomplished. If the same good results were acquired in the bovine (up to the present time they have not been) incalculable values would accrue by the transplantation of a fertilized ovum from a high producing cow to be incubated in the uterus of a less valuable one. In this manner, all the valuable characteristics would be present in the calf, and the original or biological mother could be used over and over again, theoretically, certainly never practically, 12 times the year.

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Contrary to a long established personal concept, we have believed in the comparative therapeutic activities of aspirin and phenacetin that the latter was more toxic. Eagle and Carlson of the University of Chicago in a research article appearing in the August 1950 number of *The Journal of Pharmacology and Experimental Therapeutics,* give as one of their summaries the following: "Of the standards used, phenacetin was less toxic, had greater antipyretic and analgesic activity, had a higher antipyretic index and had a greater temperature-lowering effect on normal rats than aspirin."

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In the *Veterinary Record* of August 26, 1950, Burrow and Lewis report on the use of magnesium sulfate in the handling of acetonemia in four cows. Three ounces of magnesium sulfate dissolved in 16 oz. of water, divided into two subcutaneous injections, one behind the shoulder and the other in front of it, were given. In uncomplicated cases, the results were good. Since in these four the serum magnesium level was normal before treatment, it is theorized that the ion of the added magnesium sulfate used in the treatment may have acted as a catalyst in carbohydrate reactions in the liver.

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A survey in Illinois indicates that practically all dairy herds in the state continually face the problem of mastitis infection.

A question, "Please discuss briefly the anatomy of the tendon sheaths," came to us. Anatomist W. M. McLeod at our request answered as follows: "Tendon sheaths are tubular synovial structures surrounding tendons where pressure and friction develop. The arrangement of tendon sheaths resembles in general that of the peritoneum in that they have inner, adjacent to the tendon, and outer layers, connected by a mesotendon. Tendon sheaths develop from connective tissue, and contain within their cavities synovial fluid which serves as a lubricant; normally it is of sufficient quantity to perform its function without visible distention of the sheath. The most important sheaths from the standpoint of pathology are the digital and carpal sheaths of the limbs. The extensor tendons also have sheaths; these are identified by naming them in accordance with the names of the tendons with which they are associated."

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Radioactive isotopes are attracting increasing attention for use as tracers as diagnostic agents. Necessarily for this purpose the duration of their radioactivity must be short lived; 12 to 24 hours. For therapeutic action, their radioactivity must be prolonged. The radioactive chemicals in greatest use, and the elapse of time for the dissipation of one-half of their radioactivity are: radioactive iodine, half-time life eight days; radioactive phosphorus, half-time life 14 days; radioactive sodium, half-time life 14.8 hours; radioactive iron, half-time life 47 days.

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No evidence has yet indicated that there is a strong and consistent relation between brucellosis and multiple sclerosis in man, although there is an impression in some circles that there is a relationship.

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Considering the many and varied factors that influence control and treatment of disease, the attention of the public may be focused on antibiotic agents to a degree out of proportion to their value in disease control and treatment.

VETERINARY PARASITOLOGY

A. O. FOSTER, B.A., M.A., Sc.D.
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Survival of Sheep Parasites on Pastures

Livestock producers have long known that warm, wet weather inevitably brings increased danger of losses from internal parasites, and that periods of dry or cold weather afford considerable natural protection against such losses. During comparatively recent years, however, there has been a discernibly quickened interest in the influence of environmental factors on the persistence of pasture infestation with various gastrointestinal nematodes of sheep. An excellent review of this subject, along with much new information, has just been published[7]. Although the analyses are extensive, they show, in general, that the free-living, pasture stages of Oesophagostomum and Haemonchus are very susceptible to destruction by winter weather or prolonged drought; that Nematodirus and Ostertagia, on the other hand, are comparatively resistant. The parasites of more or less intermediate susceptibility are Cooperia, Chabertia, Bunostomum, Trichuris, and Trichostrongylus.

From the standpoint of parasite control, including the judicious and timely use of anthelmintics, it seems reasonable to conclude that, in northerly climates, most of the economically important species owe their perpetuation between seasons to the fact that they are sheltered within the gastrointestinal tracts of breeder stock. The findings, therefore, offer convincing support for the argument that one or two efficient treatments of breeder animals during the winter months is a sound means of destroying seedbeds of infection that would otherwise lead to the contamination of spring pastures and consequent losses of lambs.

Nematodirus and Ostertagia present special problems, however, since pasture infestation with these parasites is not so readily destroyed and, in many areas at least, they persist throughout the winter. Although drought and high summer temperatures affect their survival adversely, these conditions cannot be relied upon to provide significant natural protection. Fortunately, Ostertagia is susceptible to removal by therapeutic doses of phenothiazine and can be satisfactorily controlled by the free-choice administration of this drug. Nematodirus is not readily removed by anthelmintics and, although there is limited evidence that the aforementioned free-choice regimen provides some measure of control, the problem of controlling this parasite may not be solved easily. Since heavy infestations cause scours and retardation of growth, investigations of specific control measures should prove highly practical.

[7]Kates, K. C., Survival on Pasture of Free-Living Stages of Some Common Gastrointestinal Nematodes of Sheep. *Proc. Helm. Soc. Wash.*, 17:39, 1950.

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Ovine Haemonchosis

Acute haemonchosis is especially feared by sheep growers because it usually strikes the lambs without obvious warning, causing severe anemia, extreme weakness, and sudden deaths, even among well fed, fat lambs. It is probably less generally appreciated, however, that yearlings and breeder animals are also frequent victims of acute stomach worm disease. In these cases, fortunately, there are usually other symptoms, notably generalized edema, which are presumably attributable to the fact that the disease progresses somewhat more slowly in older animals. A recent study from Australia[8] gives some interesting although sketchy information on the effect of experimental haemonchosis on the milk output of a ewe and the growth of her lamb. The findings are brought out in the following tabulation of selected data:

Days after Lambing	Milk Yields (fl. oz.)	Wt. of Lamb (lb.)
18	52	23
Ewe Given 12,000 Haemonchus Larvae		
33	53	33
44	29.5	41
50	11.5	42.5
Ewe Dosed with Phenothiazine (15 gm.)		
59	23	47.5
71	29	51.5

It will be noted that the intervention with phenothiazine was timely but that milk production was not restored to full output during the period of observation.

Finally, it should be emphasized that, de-

[8]Gordon, H. McL., Some Aspects of Parasitic Gastroenteritis of Sheep. *Austral. Vet. Jour.*, 26:18, 1950.

spite the heavy loss caused by the common stomach worm, this parasite is comparatively easily removed by many commonly available anthelmintics, including phenothiazine, copper sulfate, copper sulfate-nicotine sulfate combinations, carbon tetrachloride, tetrachlorethylene, and hexachlorethane. The best control is probably achieved by winter treatment of breeder animals and the free-choice administration of phenothiazine throughout the grazing season.

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Destruction of Pests and Vectors of Parasites in Poultry Manure

Studies at the Hawaii Agricultural Experiment Station[1,2] suggest the possibility of controlling many internal parasites of poultry by the use of insecticides to destroy the arthropod vectors. The method is applicable where chickens are reared above ground, permitting the droppings to accumulate under the houses. Most of the arthropods that transmit endoparasites live in such droppings and many species are susceptible to destruction by DDT, BHC, chlordane, and parathion. Since effective spreading and penetration of the insecticide are necessary, the authors recommend the use of oil solutions or emulsions. The work has not progressed beyond the experimental stage but trials with preparations containing 1% or less of the insecticide should prove beneficial in the control of flies and other pests, including internal parasites.

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Antibiotics in Trichomoniasis

Although there is little correlation between *in vitro* findings and the definitive application of drugs, a recent study[3] contains informative data from the testing of 12 antibiotics on *Trichomonas foetus*. Results of particular interest were obtained with aureomycin and bacitracin. The former rendered cultures sterile in concentrations as low as 25 mg./ml., although an impure product exhibited greater efficacy than a pure one (100 mg./ml.), suggesting the presence of an "enhancement factor" similar to that already demonstrated for penicillin. Bacitracin, on the other hand, promoted growth and longevity of the parasite, compared with control cultures, and the suggestion was made that this antibiotic may serve as a metabolite for the organism. The other antibiotics tested, with "end points"[4] in mg./ml. given in parentheses, were streptomycin (1000-2000), polymyxin A (50-75), polymyxins B and D (100/1200), circulin (250), chloromycetin (500), aureotracin (?), actidione (500-750), borrelidin (5), terramycin (500-1000). Of these, some are too toxic for usefulness (*e.g.* borrelidin) and/or unavailable commercially.

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Capillaria hepatica in Animals and Man

Two cases of human infection with the nematode parasite, *Capillaria hepatica*, confirmed by autopsy, have been recorded in medical literature. The first was a British soldier who died in India in 1923. The second, only recently described,[5] was a native American Negro child who died in Charity Hospital, Louisiana, in 1947. Spurious infections with this parasite, in which the eggs are "innocent passengers" through the alimentary tract, have been encountered during routine fecal examinations by a half-dozen investigators.

The parasite occurs commonly in the livers of rats and has been found in many other hosts, including mice, beavers, muskrats, squirrels, hares, peccaries, prairie dogs, monkeys, dogs and cats. Although the life-cycle of the parasite has been imperfectly determined, it is assumed that eggs are rarely eliminated in the feces. Ordinarily, therefore, cases of active infection, whether in animals or man, must be diagnosed by demonstrating the parasites or their eggs in liver tissue. Because the liver lesions grossly resemble multiple small abscesses or areas of focal necrosis, cases of human infection have probably been overlooked. On the other hand, the eggs of the parasite superficially resemble those of the common whipworm, *Trichuris trichiura*, and, on this account, it seems not unlikely that spurious infections of Capillaria may have been interpreted, on occasion, as indicating the presence of whipworms. Under experimental conditions, spurious infection readily occurs after ingestion of the liver of infected animals.

From the evidence at hand, it appears that *Capillaria hepatica* should be added to the long list of animal parasites transmissible to man, and that the incidence of both genuine and spurious infection is probably greater than indicated by the cases now on record.

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[1]Tanada, Y., *et al.*, DDT to Control Flies Breeding in Poultry Manure. *Jour. Econ. Ent.*, 43:30 (Feb.), 1950.

[2]Kartman, L., *et al.*, Laboratory Tests to Determine the Efficacy of Certain Insecticides in the Control of Arthropods Inhabiting Poultry Manure. *Poul. Sci.*, 29:336 (May), 1950.

[3]Cole, B. A., The Effects, *in vitro*, of Certain Antibiotics on the Growth of *Trichomonas foetus*. *Proc. Helm. Soc. Wash.*, 17:65, 1950.

[4]Lowest concentration causing sterility of culture within 24 hours.

[5]McQuown, A. L., *Capillaria hepatica*: Report of Genuine and Spurious Cases. *Am. Jour. Trop. Med.*, 30:761, 1950.

POULTRY PRACTICE PROBLEMS

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Frederick, Maryland

Sanitizing Used Feed Bags

For years, the use of second-hand feed sacks has presented a disease prevention problem. Attempts to sterilize sacks before re-use have been largely unsuccessful because the treatments tried have been detrimental to the sacks. Jungherr (*Jour. Am. Vet. Med. Assn.*, 117:324, 1950) has summarized the data available on transmission of disease by the re-use of sacks, and has reported on attempts at sanitizing used sacks.

Cyanide fumigations, ultraviolet light treatment and the use of mercurial compounds were not entirely successful. One of the problems facing commercial fumigation of sacks is to find a disinfectant which will penetrate the tight bales of sacks. Cyanide failed to consistently kill both *Salmonella pullorum* and *Eimeria tenella,* especially in the center of tight bales. Newcastle disease virus survived on mercurial treated burlap sacks for over 50 days. Ultraviolet light at a distance of 12 inches for periods up to ten minutes per side failed to show any killing power against *Sal. pullorum.*

Dielectric heat at 200 to 215 F. applied for at least five minutes appeared to be the most promising of all methods tried. This treatment killed *Sal. pullorum* and *Micrococcus pyogenes* var. *aurens* but temperatures to 280 F. for nine minutes failed to kill a spore-bearing aerobic bacillus. Jungherr assumed that since viruses are, in general, more easily killed than bacteria that dielectric heat is capable of killing them. Burlap samples impregnated with mercurial compounds showed excellent bacteria-inhibiting activity, even after quintuplicate use of the bags, but failed to completely disinfect the burlap.

One of the chief sources of contamination of feed sacks is their contact with diseased birds when sacked feed is stored in houses and on ranges. The habit of some poultrymen of using feed sacks for temporary storage of dead birds is an important source of infection. Such procedures should always be discouraged. Bulk storage of feed in rodent and insect-proof bins will do much to insure infection-free sacks getting back to the feed mills for re-use. Whenever feasible, new sacks for poultry feed should be recommended. Sacks used for poultry feeds could be diverted for re-use purposes to storage of other animal feeds or to the storage of other products. Such diversions would help eliminate this possible source of disease.

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The Ninth World's Poultry Congress will be held in Paris, France, August 2-9, 1951. Information concerning membership and participation in the Congress may be obtained by writing Dr. W. D. Termohlen, President, World's Poultry Science Association, 6638 32nd Place N.W., Washington 15, D.C. Membership in the Congress is of three types: (1) participating member, which entitles the holder to participate in the Congress and to receive the Congress reports; cost 3,500 francs ($10.); (2) wife or relatives of a Congress member, 1,750 francs ($5.); (3) absentee member entitles the holder to receive the Congress reports, 1,750 francs ($5.).

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The per capita consumption of eggs in the United States in 1949 was 376. This is a world's record, with Iceland winning second place with a per capita consumption of 255, and Canada in a close third place eating an average of 252 eggs per person per year. Other countries' records are: Australia, 240; New Zealand, 228; Sweden, 208; and the United Kingdom, 106. India is at the bottom of the list, since each person there averages only four eggs per year. (Data compiled by the Office of Foreign Relations, U. S. Department of Agriculture.)

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Electric fences are used by some poultrymen for keeping dogs and predatory animals out of the range. The electric fence is placed about six or eight inches from the outside of the regular fence and at about the same distance from the ground. It is important to destroy the grass below the fence by spraying with oil or to keep it clipped close to the ground. This is to prevent the wire from coming in contact with wet grass, which might cause a short circuit.

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The best temperature for keeping eggs, according to Prof. John Vondell of the University of Massachusetts, is 60 F. and the ideal humidity is 80%.

ABSTRACTS OF LITERATURE

Streptomycin in Small Animal Medicine

Organisms susceptible to streptomycin are etiological agents in a number of disease conditions of dogs and cats frequently referred to practitioners. Most common of the processes are otitis, conjunctivitis, enteritis, pneumonia, nephritis, cystitis, vaginitis, and tularemia[56].

Based on experience at the Ohio State University Veterinary Clinic, doses of 5 mg. per lb. of body weight resulted in a blood serum concentration of approximately 23 units/ml. at the end of the first hour, which fell to 6 units/ml. at the end of four hours. Double this dose (10 mg. per lb. body weight) resulted in a blood serum concentration of 53 units/ml. which fell to 6 units/ml. at the end of six hours. In view of these findings, therapeutic routine was established at 5 mg. per lb. body weight, repeated at four-hour intervals in most instances, and 10 mg. at six-hour intervals when the severity of the condition demanded a greater concentration.

Topical applications of a solution of streptomycin containing 25 to 50 mg. per ml. were demonstrated to be effective in external otitis and conjunctivitis in both dogs and cats. Applications were made twice daily and continued as indicated.

As an antibacterial agent in intestinal infections, this antibiotic proved potent. Little or no absorption takes place after administration perorally so that enteritis and diarrhea caused by invasion by the Proteus group of organisms respond satisfactorily; many times dramatic results are obtained. The dosage employed is 1 gm. daily in two or three divided doses, continued for two to three days. Oral administration of a single 1 gm. dose for three days to dogs weighing 20 to 35 lb. has been shown to be effective in many instances to control diarrhea symptomatic of distemper enteritis caused by the secondary invaders following distemper virus infection.

Pneumonia following virus distemper in the dog, and dysenteries caused by coccidia, Giardia, and spirochetes are most successfully treated by combination of sulfathalidine and/or penicillin with streptomycin. In pneumonia, streptomycin may be given intramuscularly or orally.

Urogenital infections caused by gram-negative organisms (coli group) responded well to intramuscular injections of streptomycin. These include nephritis and cystitis and recommended dose is 5 mg. per lb. body weight every eight hours, continued for three to seven days.

[56]Venzke, W. G., and Smith, C. Roger, Streptomycin in Small Animal Medicine. Streptomycin: Its Nature and Practical Application, Williams and Wilkins Co., Baltimore, Md., 1950.

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Action of Histamine on the Rumen

Physiological basis for the use of antihistamine therapy for the treatment of bloat may be explained by experiments reported by Clark.

It has been shown that the intravenous injection of histamine causes paralysis of the rumen. In 1942, Dougherty stated that the histamine contents of the rumen can be increased by increasing the protein content of the diet. Clark,[57] in his studies on drugs affecting the rumen motility in sheep confirmed this earlier work. Intravenous injection of 1 to 2 mg. of histamine was found to produce a prompt and complete cessation of rumen movements. It was also noted that these animals defecated repeatedly after injections. Duration of the inhibition of ruminal movement increased with the size of the dose. A split effect was observed. Rumen motility ceased on injection of 2 mg. of histamine which lasted 30 minutes. Concurrently, hypermotility of the rectum persisted for seven minutes.

It was found that the administration of 50 mg. of antihistamine reversed the action of histamine within six to ten minutes. If administered prior to injection of histamine, antihistamine blocked its action.

Rumen paresis occurs in many conditions known to be associated with high protein feeding. Diseases such as acetonemia, milk fever, and pregnancy disease of ewes are among these. Excess protein and urea introduced into the rumen after protein starvation caused inappetence and even sudden death. This is associated with the liberation of large amounts of ammonia. The author also claims that paralysis of the rumen could be caused by absorption of alkali.

Stasis may then be due to excess alkalinity, ammonia liberation in excess amounts, or toxic amines, or a combination of these. Toxic products may be histamines.

[57]Clark, R., The Paralytic Action of Histamine on the Ruminal Musculature. *Jour. So. African Vet. Med. Assn.*, 21:13 (Mar.), 1950.

CLINICAL REPORTS

Radiation Therapy in the Treatment of Lameness in a Horse*

JAY H. MILLER, B.S., D.V.M.,
Seattle, Washington

Through the use of a borrowed portable *x*-ray unit, it has been possible to make roentgenograms of the stomach of an adult hog, using barium sulfate; the pelvis of a steer, ventral-dorsal view; and the humero-scapular joint of an adult cow.

The roentgen output of the machine was calculated with a Victoreen r-meter. All readings were taken in air using an inherent filtration of 2 mm. of aluminum. As the machine was being calibrated, a case presented itself which warranted the use of *x*-ray therapy.

Case History

On December 11, a seven-year-old paint gelding with a nail puncture at the point of the frog of the left forefoot was admitted to the large animal clinic. The owner stated that the accidental nail puncture had occurred the day before. Tetanus antitoxin was given subcutaneously in the amount of 2,000 units and the puncture wound was cleaned and packed with tincture of iodine and cotton. The horse was sent home with instructions to the owner to poultice the wound every day until healing was complete. Four days later the animal was returned to the clinic. It was noted that the affected leg was being carried a full six to eight inches above the ground. Two radiographs showed no foreign bodies in the wound and the phalangeal bones appeared normal.

Preliminary Treatments

For the next two weeks the hoof was soaked in hot epsom salt solutions and white liniment was massaged around the afflicted area. On January 3, 1950, a pine tar and oakum boot was applied after the regular epsom salt bath.

Two radiographs taken at this time revealed a small spot of rarefaction on the volar surface of the os pedis (fig. 1). Procaine penicillin, 9,600,000 units, was then administered intramuscularly over an eight-day period. No improvement was noted following this therapy and the epsom salt baths were resumed.

The following week, using sterile technic, a joint puncture was made between the second and third phalanges and 5 cc. of capsular fluid were withdrawn and sent to the veterinary diagnostic laboratory. Smear stains and culture growths were reported as negative.

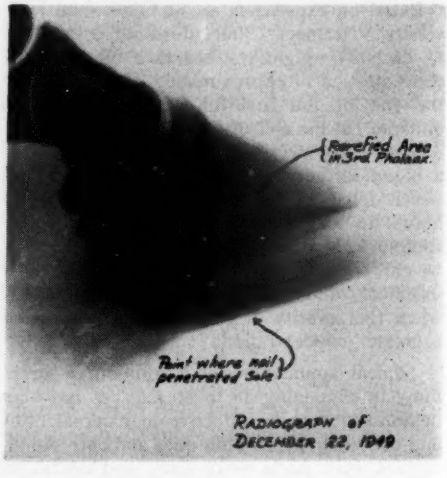

Fig. 1. Reproduction of x-ray plate taken approximately 30 days after an accidental nail puncture. Note bone rarefaction at point of entry of the nail within the bone structure of the os pedis.

Two more radiographs showed that the zone of rarefaction had increased in size. Further radiographs taken at a later date (fig. 2) showed the rarefied area had enlarged to 20 mm. long, 10 mm. wide and 10 mm. deep. The nail had penetrated the bone surface and had eventually produced what appeared to be a focal suppurative osteomyelitis of the third phalanx.

Radiation Therapy

Since normal treatments had proved ineffective, it was decided to try radiation therapy on the affected bone. The article by Dr. Myron Thom, Radiation Therapy in the Treatment of Lameness in Horses (*N. Am. Vet.*, 30:769 [Dec.], 1949), was used as a guide and 500 roentgens were administered to the affected limb from the fetlock downward. This initial treatment was given on February 9. Successive

*This case report was submitted by Doctor Miller while a senior student at the College of Veterinary Medicine, Washington State College, Pullman, as his entry (winning 4th place) in the 1950 contest sponsored by VETERINARY MEDICINE.

exposures of 300 roentgens were given on February 11 and February 15. On February 17 the horse put weight on the affected limb for the first time in two months.

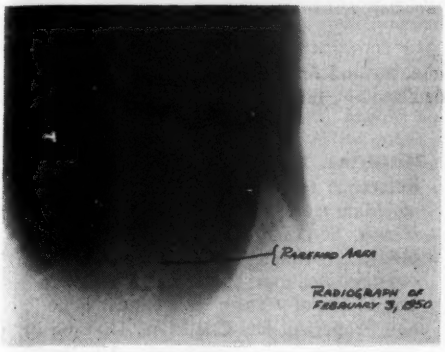

Fig. 2. Showing increased size of area of rarefaction.

During the following two-week period the affected parts received a total of 1,200 roentgen units in four exposures. Two radiographs taken on March 1 showed that the rarefied area had disappeared. Increased use of the leg by the animal was noted and additional *x*-ray therapy seemed inadvisable.

The animal was discharged on March 24. Although full weight was not borne upon the limb at the time of discharge, the continued improvement of the animal rendered further hospitalization unnecessary.

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Obstructive Icterus in an Aged Dog

KENNETH B. HAAS, D.V.M., and ANTHONY MILAKNIS, D.V.M., Chicago, Illinois

On February 2, 1950, a seven-year-old white, female, terrier-type dog was admitted to the hospital with a history of emesis and inappetence following partial ingestion of a box of wax crayons. The animal had a temperature of 102.2 F. and was extremely icteric, with all of the visible mucous membranes and total skin area of brilliant yellow hue. Laboratory examination was not desired by the owner, and a nonspecific diagnosis of jaundice was made. The possibility of wax-crayon poisoning was considered.

The animal was hospitalized for five days, during which time the appetite was consistently poor, the bowels solid but irregular, and the temperature 102 F. to 103.2 F. Treatment consisted of intravenous Ringer's solution, injections of vitamin B complex, thiamin, and liver extracts. Sulfonamides and charcoal were given orally. The condition was unchanged at time of release.

A month later the animal was re-entered for euthanasia. Physical condition was unchanged. Autopsy revealed numerous tumors surrounding the bile duct as it entered the duodenum. Bile could be manually expressed into the intestinal lumen. Macroscopically the lesions were yellow, hard, and caseous; tubercular in appearance.

Microscopically the liver showed obstructive icterus, hyperemia, bile-filled canaliculi, some of which had ruptured. The vascular endothelium was swollen. The tumors consisted of infiltrating oval cells containing numerous nucleoli. Diagnosis: hepatic duct carcinoma.

▼ ▼ ▼

Bovine Monstrosity

C. E. DUTTON, D.V.M., Saco, Maine

During the past 27 years of practice the writer has had opportunities of seeing several monstrosities born to animal patients under his care. Among these were included lambs with parasite lambs protruding from their sides, hydrocephalus puppies, kittens and calves, and

also two schistocorums reflexus calves. This case is the first in his experience of a two-headed fetus, pictured in the accompanying illustration.

Both heads of the animal were perfectly formed as were the first two cervical vertebrae (atlas and axis). The cervical spine joined at the third cervical vertebrae, the remainder of the spinal column being normal except for a slight broadening of all bones to the sacrum.

Further examination of the calf disclosed normal organs in the thoracic cavity (heart and lungs) and a normally developed liver. There were two complete sets of stomachs, one rather rudimentary. The intestinal track was single, continuing from the near normal abomasum.

BOOK REVIEWS

Books reviewed in this department and any other books, if available, may be obtained by remitting the published price to the Book Department, Veterinary Medicine, Suite 803 Livestock Exchange Building, Kansas City 15, Missouri.

VETERINARY BACTERIOLOGY AND VIROLOGY, by *Ival Arthur Merchant,* D.V.M., Ph.D., C.P.H., Professor of Veterinary Bacteriology, Division of Veterinary Medicine, Iowa State College, Ames. Fourth edition. 855 pages, 143 illustrations. The Iowa State College Press, Ames, Iowa, publisher, 1950—Price $8.50.

The significant feature of the new fourth edition of this book is the addition of a section on filtrable viruses. This is not the only change. Other subject material has been enlarged and in some cases rewritten. This has been necessary because of many advances made in the science during recent years.

Doctor Merchant's textbook on Veterinary Bacteriology has been widely used by students since the first edition was published in 1940. Since then three editions have been sold out. Its value is thus established. Not only have undergraduate veterinary students found the text material organized understandably; but researchers, practitioners and others have found it useful.

Contents are divided into four parts: Part 1 is devoted to general microbiology, including scope and history of development of the study of microscopic living forms as a science. General morphology and physiology of microorganisms, bacteriological technic, and sterilization and disinfection are considered here. A chapter is devoted to antibiotic agents. In part 2, the author discusses those factors dealing with infection, resistance and immunity. Part 3, the largest section, is written in the classical academic style. In this is given the classification and characteristics of pathogenic microorganisms, yeasts and molds. These are restricted, necessarily, to those of primary interest as disease-causing agents in animals. Others responsible for diseases transmitted from animals to man are included. These may cause diseases transmitted to man as contagions; or by way of meat food products. Part 4, previously mentioned, prepared by Dr. R. A. Packer, constitutes a basis for the study of virology.

The book reflects favorable credit on the authors. Its value as a reference text will not disappoint users. All chapters are appended by extensive and carefully selected reference lists. Books and papers listed in these amplify those diseases and organisms in the field of medical bacteriology of interest to veterinarians.

▼ ▼ ▼

MEDICAL ENTOMOLOGY, With Special Reference to the Health and Well-Being of Man and Animals, by *William B. Herms,* Sc.D., Late Professor of Parasitology, Emeritus, University of California; one-time lecturer in Tropical Medicine, University of California Medical School, San Francisco; late Chairman, Division of Entomology and Parasitology, University of California. Based on the book known as Medical and Veterinary Entomology. Cloth Bound. Fourth edition. 643 pages, 191 illustrations. The MacMillan Company, New York, publisher, 1950.—Price $9.00.

The original manuscript for this book was prepared about 40 years ago and the first edition entitled Medical and Veterinary Entomology, appeared in 1915. The general plan of the book appears unchanged and stress continues to be placed upon the life history and ecology as fundamental to rational control and as basic to sound epidemiological control.

The author's treatment of his subject from the standpoint of entomology is excellent in most chapters and the illustrations are good. For example, chapter V, Structure, Development and Classification of Insects and Arachnids, and chapter VI, Insect and Arachnid Mouthparts, are two excellently prepared chapters, well illustrated and should be useful to anyone desiring information in this field.

The most valid criticism is that the book is too extensive in scope and parts of the vast field are covered somewhat superficially. The average veterinarian would not find much detailed information that would help him solve any specific problems. For example, in discussing demodectic mange of animals, mention is made of a number of impracticable treatments and it is admitted that the chances of cure are slight. The author's most sensible recommendation is that a valuable dog be placed under the care of a "skilled veterinarian." In discussing sucking lice of mammals, pp. 127-130, Doctor Herms lists most of the common lice of mammals but some mention should

have been made of the bionomics of lice, influence of temperature, density of infestation, seasonal increase in degree of infestation. The recommendations for control are not practical. Few farmers would consider it economical "to install a good dipping vat as part of his equipment" particularly now that the application of many of the chlorinated hydrocarbons have been shown to be effective by spraying (and dusting). The reference to benzene hexachloride, second paragraph of page 130, and its potential danger when used on dairy cows is probably sound. However, the concentration of the gamma isomer required to kill lice is so low that it may be used safely on all cattle except cows actually in the milking line and baby calves. This is particularly true if the pure gamma isomer (lindane) is used.

In discussing treatment and control of warbles, again many of the treatments recommended are questionable. For example, the practice of introduction of snuff, pepper or other irritating substances into a sheep's nostril to induce expulsion of the grub by sneezing was never of value and is now obsolete. "Salt logs" in which salt is placed in holes in logs and the periphery of the hole ringed with tar have proved practically worthless as preventive devices. No mention was made of the creolin treatment developed in New Mexico by federal veterinarians.

Although many of the treatments and preventive measures advocated by the author can be discounted, the work contains a wealth of information not readily available elsewhere.

The book should be of great interest to those who seek an overall picture of the huge field of medical and veterinary entomology and as such deserves a place on the bookshelf as a reference book for veterinary practitioners.—*R. D. Turk, D.V.M.*

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NEW AND NONOFFICIAL REMEDIES (N.N.R.), 1950. Issued under the direction and supervision of the Council of Pharmacy and Chemistry, American Medical Association. L. B. Lippincott Co., Philadel, Pa., publisher, 1950.—Price $3.00.

This book is published, as noted above, by a standing committee of the A.M.A. to consider medicinal and allied preparations offered by manufacturers of therapeutic agents used by physicians. In it they list and describe articles accepted by the Council up to January 1 of the year of publication. Periodic revision eliminates those items previously described that failed in wide clinical tests, or which have been official for 20 years.

The book is of limited value to practicing veterinarians.

▾ ▾ ▾

Foreign Veterinary Textbooks

Since this column first appeared in the May 1950 issue of VETERINARY MEDICINE, the following books have been received for review:

DIE BIOCHEMISCHEN GRUNDLAGEN DER TIERERNAHRUNGSLEHRE, by Prof. Dr. Karl Scharrer. 162 pages. Ferdinand Enke, Hasenbergsteige 3, Stuttgart, West Germany, publisher, 1950. A scientific discussion of the biochemical foundation of animal nutrition, *e.g.*, of carbohydrates, fats, albumins, enzymes, vitamins; also of metabolism, energy, balance, value of feedstuffs, etc. The author emphasizes that today more than half of animal diseases are due to improper nutrition.

PHYSIKALISCHE TIERMEDIZIN, by Dr. O. K. Eggert. 187 pages, 124 illustrations. Ferdinand Enke, Hasenbergsteige 3, Stuttgart, West Germany, publisher, 1950. Volume 1 of the first treatise on physical methods used in modern veterinary medicine deals with therapeutic technics which make use of water, low temperature, heat, light and radium. A special part describes the physical treatment of many diseases of the skin, muscles, bones, of circulatory, respiratory and genital organs, and of the digestive and urinary tracts.

PHARMAKOLOGIE FUR TIERARZTE, by Dr. Karl Steinmetzer. 346 pages, 30 illustrations. Urban & Schwarzenberg, Frankgasse 4, Wien 9, Austria, publisher, 1949. The author has written, for veterinary practitioners, a special "pharmacology of the various organs," such as the nervous system, eyes, heart, and blood vessels, etc. The chapters on general principles of pharmacology and on prescription writing, home pharmacy, and preparation of remedies are of practical value.

GRUNDLAGEN EINER KLINISCHEN HAEMATOLOGIE DER HAUSTIERE, by Prof. Dr. David Wirth. Second edition. 372 pages, 94 illustrations. Urban & Schwarzenberg, Frankgasse 4, Wien 9, Austria, publisher. This is a hematology of domesticated animals. Its three parts consist of a general discussion of blood and blood investigations, of normal blood pictures, and of a special pathological hematology (over 200 pages).

VETERINARY ITEMS OF INTEREST

Treat a parasitized animal as a sick animal.

▼

One-half the nation's dairy cows under advanced registry testing programs are Guernseys.

▼

More than 40% of all pigs farrowed die before reaching market age.

▼

Mastitis is the most costly of animal diseases, constituting a serious problem in all dairying sections.

▼

Nearly all endocrine disturbances in cattle are related to cystic ovaries.—*Wilson R. Haubrich, V.M.D.*

▼

A vast amount of research work has firmly established the need of animals for at least 13 mineral elements.

▼

Closing up the poultry house too much traps moist air. Wet floors and dripping walls will result even though deep litter is used.

▼

Broiler and fryer production for the November market is estimated as 50% larger than a year ago.

▼

Indiscriminate and careless use of dilators and milk tubes by unthinking caretakers is responsible for many cases of mastitis in dairy herds.—*Richard S. Guthrie, D.V.M.*

▼

Under average conditions, a hen will drink two pounds of water for each pound of feed she eats; cattle and swine will drink three pounds of water for each pound of feed.

▼

Vitamin A has an important role in abortion of cattle and sheep. When late summer pastures provide little green feed and winter rations a poor quality of hay, high incidence of abortion may be expected the following spring months.

Infected animals are the reservoirs of parasite infection.

▼

Legume pastures that have been frosted or frozen constitute a danger to cattle from bloat.

▼

Effective dilutions of insecticides are generally most toxic for young animals.

▼

Anthelmintics cannot restore poundage lost due to subclinical parasitism. — *R. D. Turk, D.V.M.*

▼

Growth depends on the quality of proteins in the ration; the proper distribution of essential amino acids.

▼

The results of a single mastitis test should never be considered conclusive evidence of the presence or absence of infection.

▼

Careful planning to provide an adequate, nutritious diet serves well in the control of many animal parasites.

▼

Broad demand for breeding stock is given as one reason for scarcity of feeder lambs this season.

▼

There is strong circumstantial evidence that certain species of the biting fly family are natural vectors of deerfly fever, ulceroglandular type of tularemia.—*Pub. Hlth. Repts.*

▼

During the past 20 years there has been and is still a trend upward in the quantity of fluid milk produced in the United States. During the same period, the number of milking herds has declined.

▼

Considering the many products of agriculture and industry for which Texas is famed, it is to note with pleasure that 45% of the agricultural income of the state comes from the sale of livestock.

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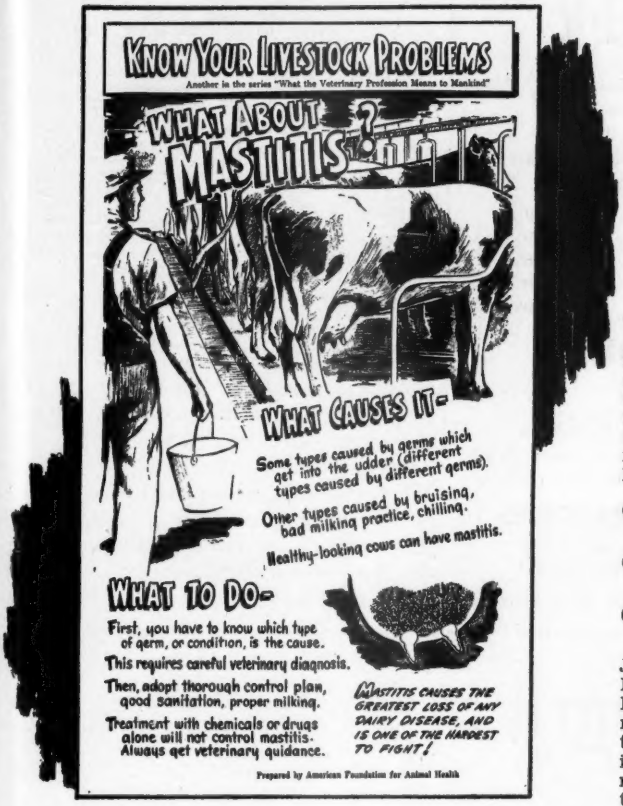
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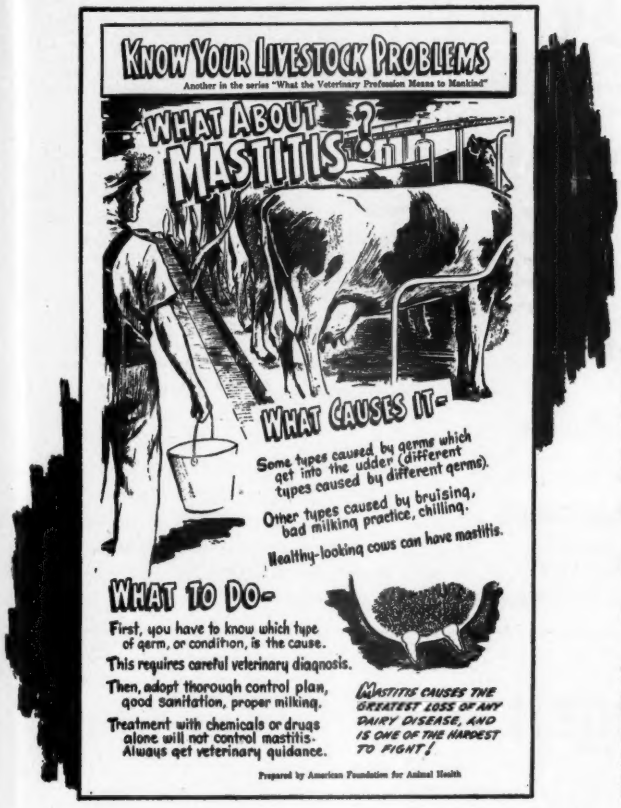
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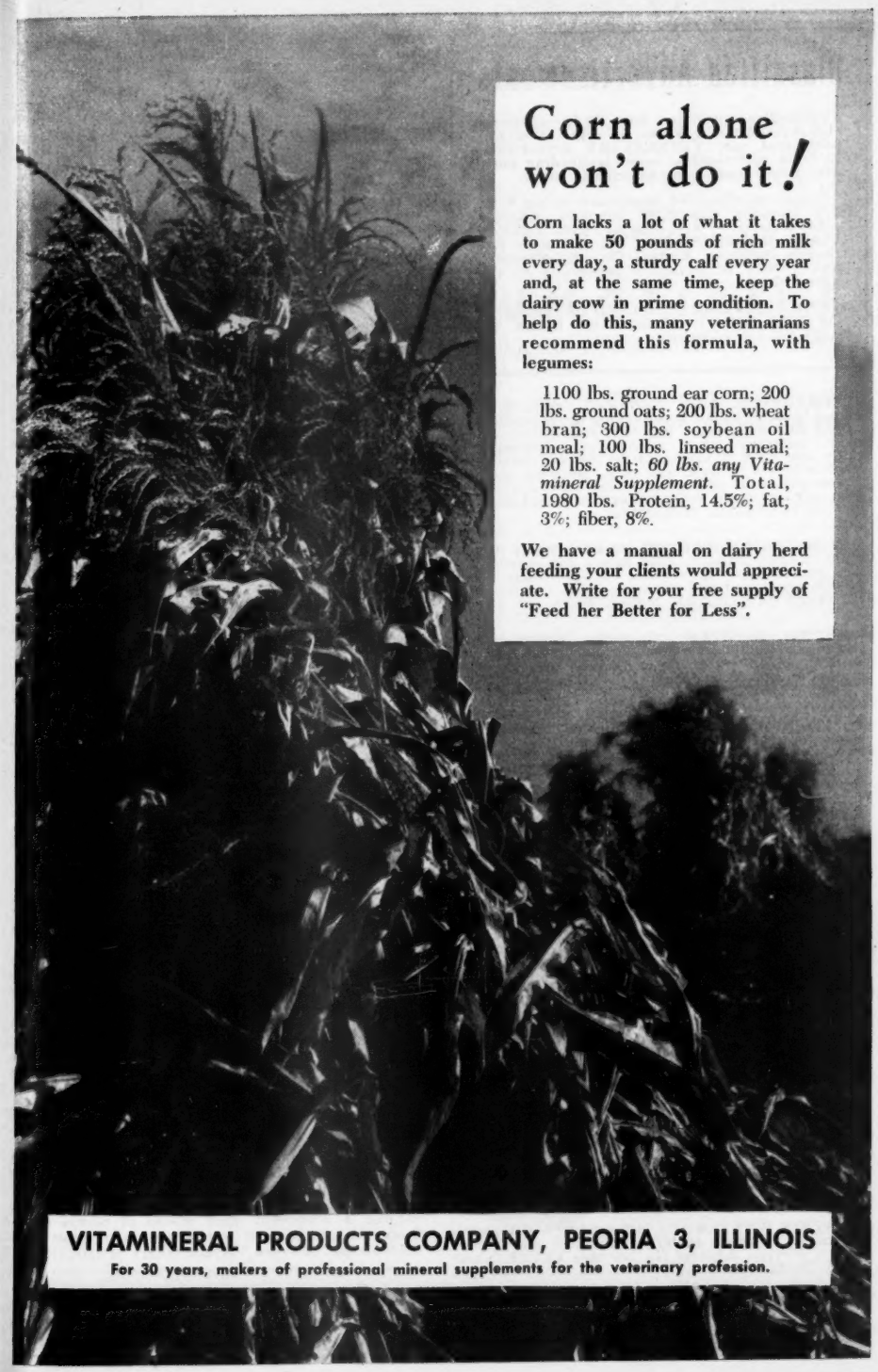
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